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ALUMNI NUMBER

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The George Washington University

(FORMERLY COLUMBIAN)

Bulletin

JUNE, 1906.

ALUMNI NUMBER.

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The George Washington University
BULLETIN

VOL. V. JUNE, 1906. No. 2.

425710

PRESIDENT NEEDHAM TO THE ALUMNI.

I desire to present to the Alumni the greetings of the University, to briefly state the results of the last year's work, and the needs and the aims of the University.

Our reorganization has been successfully completed and we are already beginning the new growth. The University is non-sectarian in its organization and work. It is composed of Departments, under the immediate direction and support of the University Board, in which post-graduate work and professional education is carried on. This constitutes the whole of the educational work which the Board of Trustees of the University is conducting. The Colleges already organized are the Columbian College, an arts and science undergraduate College; the College of Engineering, with complete undergraduate courses in civil, mechanical and electrical engineering; and the College of Pharmacy, also an undergraduate college. These Colleges are educationally a part of the University but each has its separate Board of Trustees and is upon an independent financial basis. The Colleges have passed a very successful year. Columbian College has registered 303 students, the College of Engineering 135; the Division of Architecture 37; the College of Pharmacy 72. In the Departments of the University the attendance has been equally encouraging. In the Department of Medicine 280 have registered; in the Department of Dentistry 63; Department of Law and Jurisprudence 519; Department of Politics and Diplomacy 27; in Graduate Studies 82; in Teachers' Courses 93; making a total registration last year of 1,580. The Faculties number 200.

While we rejoice in the large increase in numbers we are more deeply gratified by the development of the University and academic spirit. These Departments and Colleges are being bound together into one common life and we begin to feel the pulsation of that institutional life which is greater than any part or Department can possibly be. "A university," it has been said, "is not so much a place where all that is known is taught, as a place where noble and luminous minds create an atmosphere which it is impossible to breathe and not feel the quickening of new and larger hopes and aims—minds that are less concerned to impart information about things than to solicit, call forth, sustain and strengthen and bring into action the powers which lie latent in the human soul; striving themselves day by day to become wiser and more loving, that with each access of new life they may thrill, inspire and impel others to generous and persevering self-activity."

We are striving for this community life and hope that upon the new site now already paid for we may soon begin building and that the Alumni will soon complete the contributions necessary for Alumni Hall, which is to be the centre of the social life of the University.

All will agree, I am sure, that it is essential that we should strive for the best and largest student body possible for the University as a whole, and that the University should become the peer of the best institutions in this country. To do this we have been compelled to consider whether the courses of study and class-room hours should be, in the future as in the past, arranged primarily for those students in Government employ, who can devote only part of the day to the University, or, whether, the arrangement should be primarily for full day students, giving to the former full opportunity to carry on work in any Department or College of the University, but requiring of them a longer period of time in which to earn a degree. The quality of the students that the University has had from the Departments of the Government has been of a high order. They are serious-minded, well equipped young men, but the number is necessarily limited, and if the University is to grow it must appeal to a wider field and a larger number of prospective students. If the courses of study are arranged primarily for afternoon work the full day men will not come to us in any great numbers. To secure the full day students there must be class-room work going on throughout the day as in other institutions. After very thoughtful and careful consideration it was determined to take all the work out of the evening hours, closing the class room work at six-thirty, and to arrange the courses in all the Departments for full day work, beginning at eight and nine o'clock in the morning. To do this involved an increase in the number of professors and instructors giving their whole time to the University. Thus in Arts and Sciences we have already added fifteen men of this type to the Faculty; we shall have next year in the Department of Medicine four, and in the Departments of Law and Jurisprudence and Politics and Diplomacy five, teachers, giving their full time to the work.

We have also changed the method of teaching, especially in the professional schools. The student is brought face to face with the facts to be learned. In the Medical School clinical teaching has been largely increased, taking the place of didactic lectures. In the Law School the study of cases has been substituted. We seek to make men find knowledge for themselves and learn to use their intellectual faculties in applying the knowledge thus obtained to actual cases. This requires a higher standard of preparation for the work, and by an Ordinance adopted by the Trustees, at least two years college work will be required after 1908 for admission to the Department of Medicine, and to the Department of Law and Jurisprudence. In the Department of Politics and Diplomacy we already require a college degree or its equivalent.

The standard of work in the post-graduate courses is excellent and the number already enrolled for higher degrees is very gratifying. The graduate Department of Arts and Sciences is to be the crown of the new University system, but before we can realize the high ideals aimed at in this Department we must have a $2,000,000 endowment devoted to instruction, laboratories and seminary equipment.

We are in great need of a new building for the Department of Politics and Diplomacy, and an endowment to enable us to secure an able Dean and coadjutors for this work. President James, of the University of Illinois, writing upon the subject of "a great educational institution in the city of Washington," namely, a School of Politics and Diplomacy, says:

"Here is the natural place for such a centre of scientific investigation. Here is the place where men interested in this department of our racial life most congregate. Here is the only centre of diplomatic influence and power in the country. Here are the ablest statesmen; here are the greatest courts. * * * * * * * * * * A great school of this kind would prepare men for the public service as at present no men are prepared in the United States. The existence of such a school and the preparation which its graduates would have, would call the attention of the federal administration to the fact that it could obtain competent men for any administrative position within its gift, and the supply of men for such training would create a demand for their services."

I desire also to call the attention of our Alumni to the need of a new building for the Department of Law and Jurisprudence. Already we have outgrown the present accommodations. We have the ground and are pressingly in need of money for the building. If an Alumnus has the money and desires fame let me commend to him the building of a Hall, to be named after him, upon Seventeenth Street just below the State Department, that shall house the Law and Jurisprudence School of this University.

But especially I appeal to you to have an active interest in the plans of the officers of the General Alumni Association, who are now raising funds for the erection of Alumni Hall. It is desired that every Alumnus may have a share, however small, in this building, so that it may be an abiding testimonial to the patriotism and affection of the old students for their Alma Mater.

Institutions of learning are made by the men that compose them, and a very important section of this body is the Alumni—men who have gone out from the institution which has equipped them for life. No institution can prosper largely that does not have the hearty support and coöperation of the great body of its graduates. In these new movements the University makes its appeal to you and asks for your intelligent and hearty support in its new plans and desires you to share in all the honors that come to the University as the result of its new and expanding life.

CHARLES W. NEEDHAM.

The George Washington University,
June 18, 1906.

WHAT THE UNIVERSITY IS DOING.

THE UNIVERSITY.

The session of 1905-06 has been the most prosperous year in the history of the University. The total enrollment of students is 1,580, representing 48 states and territories, Hawaii, Porto Rico, and the Philippines, and of foreign countries, Canada, Chili, China, Costa Rica, England, Finland, Germany, Hungary, Korea, Mexico, Russia, Turkey, Uruguay, and Venezuela. The total for 1903-04 was 1,408; for 1904-05, 1,456; showing an increase over last session of 124. The student body consists of 109 graduate, 568 undergraduate, and 934 professional students.

The members of the faculties and teaching staff now number 200, being an increase of 30 instructors over the session of 1904-05. In October, 1905, the National College of Pharmacy was affiliated with the University under the Act of Congress providing for the incorporation of colleges under the University charter.

The University Library has been enriched through the donation of several thousand volumes, in addition to its regular purchases. The Germanic Library of the late Professor Richard Heinzel of the University of Vienna, acquired through the generosity of Mr. Christian Heurich, contains 7,200 volumes and pamphlets bearing on German philology and literature, and a large number of works and periodicals in the cognate branches, notably Anglo-Saxon, Old English, Slavic and the Romance languages. Mrs. John Hay has presented to the Department of Politics and Diplomacy a choice collection of books from the library of the late Secretary of State. Professor J. Ford Thompson, M.D., has presented to the Medical Department his valuable library of books on surgery. The work of classifying and cataloguing the contents of the various libraries has been successfully carried on by the librarian and assistants.

The University Bulletins have been regularly issued under the supervision of the Board of University Publications. The Alumni Number, which appeared in June 1905, contained a summary of the work of the University for the session of 1904-05, and an alphabetical list of Alumni arranged (1) by names, and (2) by cities, compiled and edited by Professor H. L. Hodgkins, Secretary of the General Alumni Association. The October scientific number contained important papers by members of the faculties, abstracts of Ph.D. theses, a supplement to the Bibliographical Record of 1904, notices of works published by professors, University appointments and miscellaneous items. The December number was devoted to the Department of Politics and Diplomacy, containing a series of papers by members of this Faculty, and notices of their scientific contributions. The Board has begun the publication in series of studies in (1) philosophy, (2) philology and literature, (3) pure science, (4) politics and diplomacy, (5) law and jurisprudence. The University Catalogue appeared in March, 1905, together with separate announcements of the Departments of Arts and Sciences, Medicine, Dentistry, Law, and Politics and Diplomacy. The October issue of the Bulletin is, by vote of the President's Council, to be devoted to the interests of the Department of Medicine, and the December number to the Faculty of Graduate Studies. The University publications are sent to 234 American universities and colleges, and 90 foreign universities, and the list of exchanges already received, embraces 45 American and 20 foreign scientific periodicals, in addition to catalogues and circulars.

During the session Teachers' Courses were offered to the public school teachers of Washington, as follows: Aesthetics by Professor Raymond, Architecture by Professor Ash, Classical Archæology by Professor Carroll, Diplomacy by Professor Foster, Economics by Professor Veditz, English by Professor Wilbur, History by Professor Swisher, and Constitutional Law by Justice Harlan.

The courses were chosen from those regularly given at the University which appeared most nearly related to topics treated of in the public school work and which appeared most directly to appeal to the teachers. The attendance of teachers was 15 on Aesthetics, 7 on Archæology, 10 on Architecture, 11 on Diplomacy, 5 on Economics, 18 on English, 17 on History, and 10 on Constitutional Law, there having been 93 teachers in all who availed themselves of this opportunity for work at the University. This was an increase of 27 teachers over the attendance in the year 1904-05, 66 teachers being enrolled for that year.

This scheme has met with the hearty coöperation and approval of the Board of Education and of Mr. Stuart, Superintendent of Schools of the District of Columbia. In fact the selection of those who are to be admitted to the various courses is made by the latter from among the applicants, he having full knowledge of the special needs and qualifications of the candidates. This plan has proved of value to the University by bringing its professors in close contact with the public school system and by giving a considerable number of the teachers an opportunity to view closely the work of the University.

DEPARTMENT OF ARTS AND SCIENCES.

Faculty of Graduate Studies:—The total number of candidates registered under the Faculty of Graduate Studies for the year 1905-06 was 82; there being 12 candidates for the M. A. degree; 12 candidates for the M. S. degree; 2 candidates for the C. E. degree; 2 candidates for the E. E. degree; 1 candidate for the M. E. degree; 5 students in attendance, and 48 candidates for the Ph.D. degree. Of this number 17 were recommended for graduation: 5 for the M. A. degree; 5 for the M. S. degree; 2 for the C. E. degree; 2 for the E. E. degree; 1 for the M. E. degree, and 2 for the Ph.D. degree. The Doctorate Disputation was held on May 28th, and the two candidates who presented themselves most satisfactorily defended their theses and received the commendation of the Board of Experts. During the year the Faculty has been strengthened by the addition of Henry L. Abbot, U. S. A., as professor of hydraulic engineering; Edward B. Rosa, Ph.D., as professor of physics; George M. Sternberg, M.D., U. S. A., as professor of preventive medicine; and Frank Leighton Day, Ph.D., as professor of Semitic languages and literature.

As at the last annual commencement we completed twelve years of work, under the present organization, it has seemed wise to make a statistical inquiry into the results and more particularly as they relate to the conferring of the Doctor of Philosophy degree. The results of an examination of the records from 1893 to 1905 are as follows:

Total admissions to all degrees	433
Total degrees of all kinds awarded	242
Per cent of graduates	55.89
Total admissions to candidates for Ph.D	113
Total degrees awarded	31
Per cent of graduates	27.43
Total number of years of work given by candidates admitted to candidature for Ph.D. degree dating from the Masters degree	369
Average for each candidate	2.77
Total number of years of work given by candidates receiving the Ph.D. degree dating from the Master's degree	86
Average for each candidate	2.77

In the cases of ten of these candidates credit was given them on the required work of the course for work pursued and properly certified elsewhere. Adding a year for each of these, we have:

Total number of years of work given by candidates receiving the Ph.D. degree dating from the Master's degree	96
Average for each candidate	3.1
Total number of years elapsed from date of Bachelor's degree to receiving Ph.D. degree	364
Average for each candidate	11.7

Columbian College:—The academic year just closing has been educationally a prosperous year. The graduating class numbers 25—16 Bachelors of Arts, 17 Bachelors of Science, 2 Bachelors of Science in Chemistry. The good student quality that we have to deal with is suggested by the fact that 9 out of the 16 students in the Bachelor of Arts course have for their entire course above 92% of their marks over 90%.

The student registration in Columbian College this year has been affected by the establishing of the Washington College of Engineering with the segregation of 135 students, and of the Division of Architecture with 37 students. Notwithstanding this setting off of 172 students from Columbian College there is this year a registration of 303. This is but 140 less than last year, showing a net increase of 32 to be accounted for. The fact that there is this year an increase of 18 students in the course for the Bachelor of Arts degree would show that the College has shared largely in the general increase of students.

The additions to the teaching staff of the College have come through the necessities of our long schedule from 9.30 A. M. to 6.30 P. M., through the demand for instruction in subjects new to our curriculum but of fundamental importance, and through the increased burdens of teaching and administration due to the growth of the student body. In addition to the efficient teaching of professors and instructors giving a limited number of hours to the University, there have been added this year the following who have given their entire time: Professor Veditz in Economics, Professor Hough in Philosophy, Dr. Macwhorter in Latin and Greek, Mr. Peck in Mathematics, Mr. Croissant in English, Mr. Keith in Romance Languages. These men have largely increased the amount and efficiency of instruction.

Washington College of Engineering:—The number of enrolled students has been 135, distributed as follows:

	Freshmen.	Sophomore.	Junior.	Senior.	Total.
Civ. Eng.	23	21	12	3	59
Elec. Eng.	15	15	6	2	38
Mech. Eng.	12	11	2	..	25
Special		..	..	..	13
	50	47	20	5	135

The formal organization of the Washington College of Engineering and the appointment of instructors giving their entire time to the University, has made it possible to do the technical engineering work more efficiently than in previous years, when our engineering instructors were present only after half past four o'clock. During the present session in the technical subjects of applied mathematics, graphics, civil engineering, electrical engineering, and mechanical engineering we have given each week a total of 42 hours of class-room work and 29 hours of laboratory and drawing work under direct supervision of instructors, and of these hours, 9 hours of class work and 19 hours of laboratory and drawing work have been given before half-past four.

The work that we plan to give next year shows a considerable increase over that of the present session. This is due partly to the fact that during the present session we did not offer certain advanced courses in electrical and mechanical engineering, which must be given next year; and, more especially, to the fact that in the reorganization of the work in engineering we have expanded some courses and have very largely increased the hours of drawing, design, and laboratory work, all of which hereafter is to be at assigned hours under the direct guidance and supervision of instructors. Accordingly our weekly schedule for next session for the technical courses calls for 50 hours of class-room work and 73 hours of drawing and laboratory work. This is an increase of 8 hours of class-room work and 44 hours of drawing and laboratory work; of this work 24 hours of class-room and 40 hours of drawing and laboratory work are to be given before half-past four o'clock.

The experience of the present session has shown that there is a call for engineering courses in this city and that this call can be met only by having instructors giving their whole time to the work of the College. Accordingly, the plans for next session provide for the appointment of three instructors, who will displace some instructors who have given but a few hours each week, and who will also be able to take the additional hours called for in our revised schedule.

Necessarily the general subjects—languages, mathematics, physics and chemistry—which are taken in common with the students of Columbian College, will be given in the main building of the University, but we plan, so far as the schedule will permit, to have the engineering subjects given at the Van Ness House. If the increase in instructors that has been recommended be allowed by the Board of Trustees, there will be at least 2 and usually 4 instructors always at that building, and the laboratory and drawing work will be under continual supervision, not only at the assigned hours, but also at all times at which students may desire to work.

Division of Architecture:—The efficiency of the Division of Architecture has been materially increased during the past year by the appointment of Mr. A. B. Bibb, Professor; Mr. Charles Mason Remey, Instructor; and Mr. Hupert P. Illman, assistant. Professor Bibb takes charge of the instruction in the history of architecture, painting and sculpture, giving his entire time to this work. The congestion of former years has been obviated by the Division having use of the entire building, 813 Fifteenth Street, N. W. The attendance during the past year has shown an increase of over 20%, the total number of students registered being 42. The George Washington Architectural Club, a student organization, has been admitted during the past year to membership in the Architectural League of America, as a junior member and was represented at the League Convention held in New York City at the Fine Arts Building in March last. They have also offered three prizes of architectural books, one to each class for the best work in design during the year; also a prize membership in the Washington Architectural Club offered by the Club for the best work in design is annually awarded. The work of the students on the Beaux Art problems has been very successful and the University is to be congratulated on the showing made during the past year. Twenty-three drawings were made and submitted to the Committee in New York in competition with drawings from other prominent universities and atelier's throughout the country; of these twenty-three drawings one received fourth place and eighteen received mentions, a most creditable record. A minimum period of four years is required for the degree of B. S. in Architecture covering 80 units of work.

DEPARTMENT OF MEDICINE.

Faculty of Medicine:—The total registration was 280 students distributed as follows: First-year class, 62; second-year class, 60; third-year class, 75; fourth-year class, 68; special and review students, 12. The degree of M.D. was conferred upon 49 members of the senior class at the annual commencement. The most noticeable work done during the year was in the increased amount of clinical instruction given in the University Hospital and other hospitals. No other graduating class has gone forth better prepared for the practice of medicine than the class of 1906. Plans are being made to perfect still further the clinical facilities and instruction. The Medical Library has increased considerably by gift and purchase. Professor J. Ford Thompson has presented his valuable surgical library of about 700 volumes, containing many rare works in surgery. Through Mr. Wycoff, the library of the late Dr. L. C. Osmun, class of 1860, was given to the Department, and Dr. H. C. Yarrow has donated regularly periodicals and from time to time a number of valuable works.

A great many hospital appointments have been bestowed during the year on recent graduates. The following Alumni have successfully passed the U. S. Naval Medical Examining Board, and have been commissioned Assistant Surgeons U. S. Navy: Philip E. Garrison, '05; Heber Butts, '04; Thomas W. Raison, '05; A. H. Robnett, '05. Dr. Francis R. Hagner, '94, Clinical Professor of Genito-urinary Diseases, has just been elected Treasurer of the American Urological Association. Dr. J. Ford Thompson, after an active teaching life of more than thirty years as Professor of Surgery, will shortly sail for Europe. Dr. Albert Van der Veer, '62, and LL.D. '04, of Albany, N. Y., has been elected a regent of the University of New York. At an annual meeting of the George Washington University Medical Society which was held May 19, 1906, the retiring President, Dr. A. Barnes Hooe, delivered an interesting address on the history of the Medical Department. The following officers were elected for the ensuing year: John W. Chappell, '81, President; Hanson T. H. Lemon, '96, Vice-President; D. Webster Prentiss, Jr., '99, Secretary; Lewis H. Taylor, '03, Treasurer. A number of valuable papers have been read before the Society. These will appear in the October number of the University Bulletin which will be devoted to the Department of Medicine.

Beginning with the session of 1909-10 no student will be matriculated for the degree of Doctor of Medicine (a) who has not completed satisfactorily in an approved college or scientific institution two years of work of a regular course for a baccalaureate degree or (b) who does not possess equivalent educational training and requirements.

The Departments of Medicine and of Dentistry, which have been heretofore separate organizations, have been reorganized by the Board of Trustees under one faculty composed of professors, assistant professors and instructors in medicine and of professors and assistant professors in dentistry. There will be a dean of medicine and a dean of dentistry, but the courses of instruction, the University hospital and the dental dispensary will be under the supervision of the one faculty.

Faculty of Dentistry:—There were 23 students in the first-year class, 16 in the second, and 24 in the third, a total of 63. Of these 12 received the degree of D.D.S. on Commencement Day. This was the first session in which the higher entrance requirement, namely, a high school certificate, or its equivalent, was rigidly enforced. The examiner reports that 20% of the students who came before him failed to meet the matriculation conditions. Educationally the session was highly successful, and the lectures and laboratories were well attended. In the Dental Infirmary the instruction proceeded with better results than ever before. The British Examining Board has recently formally recognized the diploma of the Dental Faculty of the University.

College of Pharmacy:—The Faculty of Pharmacy consists of 5 members and 4 assistants; during the coming session the faculty will receive two accessions. The total number of students for 1905-'06 was 74. The number of freshmen advanced to the junior class was 13; the number of juniors advanced to the senior class, 14; the number of senior students who were recommended to receive the degree of Doctor of Pharmacy was 11. The Dean in his annual report to the Trustees of the College of Pharmacy called attention to the standard of admission that was in force in other departments of the University and the necessity for raising the standard of admission to the classes of the College of Pharmacy in order that the College should fully conform with the educational requirements of the University. The trustees have taken up the matter and changes that will meet with the approval of the University will soon be announced.

DEPARTMENT OF LAW AND JURISPRUDENCE.

The total attendance in this department during the past session was 519, of whom 394 were regularly matriculated as undergraduate candidates for the degree of Master of Laws; 34 for Master of Patent Law, and 1 for the degree of Doctor of Jurisprudence; the remainder were special or review students. Of the 115 members of the third-year class who were candidates for the LL.B degree. 87 were graduated. Of the 11 candidates for the LL.M. degree, 5 have been successful; while 19 of the 34 candidates for the M.P.L. degree were graduated. There were also 5 students to receive the degree of Doctor of Civil Law. This gives a total of 114 graduates from this department. Viewed as a whole there is much in the work done during the past session to encourage us in the belief that a great school of law can be built up in this University. Almost without exception the students have worked faithfully and seriously, and despite the fact that the standard for graduation has been distinctly raised, the number of failures has been gratifyingly small. Many of the professors are now using the case system of teaching law, which has in nearly all instances proved highly acceptable to the students. It is believed that we can without boasting say that in many of our courses the work is now as good as can be had anywhere in this country, and that in our practice work better results are accomplished than in any other school of law.

The most important change that has been made during the past year, to go into effect with the beginning of the next session, is to put a considerable portion of the regular work in the department in the forenoon hours. Nine hours of work each year, however, will be given in the afternoon as heretofore. This will put our law school upon a full day basis and enable us to attract and hold students who are in a position to give their whole time and strength to the study of the law. The subjects given in the forenoon and afternoon will be so alternated as to provide an opportunity for students who are otherwise employed during part of the day to enjoy all the facilities for the thorough study of the law that are given to full day students and permit their graduation after four years. While it is probable that this change will considerably cut down the attendance in the department in the immediate future, it is believed that it will ultimately greatly increase the attendance, the excellence of the work, and the influence of the law school in the educational world.

Another important change, made in response to the general trend in the development of the best law schools in the country, is to require of candidates for a degree two years of college work before beginning their professional training. This provision, however, does not go into effect until the beginning of the session of 1909-10.

The library has been considerably enlarged.

In October 1905, James Brown Scott, A.M., J.U.D., late of Columbia University Department of Law, and Alfred Nerinex, LL.D., Professor Ordinarius of Constitutional Law in the University of Louvain. and Legal Counsellor of the Belgian Legation, were added to the faculty.

Department of Politics and Diplomacy.

The work of this Department during the past session has been entirely post-graduate. There were 22 professors and instructors, and 27 students. 14 required courses and 20 elective courses were given, in addition to the regular work of the seminaries. The instruction was embraced under the general heads of (1) public law; (2) political science; (3) economics and sociology, and (4) history. James Brown Scott, A.M., J.U.D., has been added to the Faculty as professor of international law and diplomacy, and James C. Monaghan, A.M., lecturer on the consular service, has been appointed professor of commercial economics.

STUDENT LIFE

Foot Ball:—The striking feature in foot ball at the University last season was not so much the number of games won, as the marked difference between the grade of the teams on that schedule and that of two and three years ago. As rapid as has been the growth in strength of the team, just so rapid has the field of contests widened and the grade of teams that are sought to be placed on the schedule improved. The schedule last year included nine games, those with Gallaudet and St. John's College being victories, with Johns Hopkins and University of Maryland being ties, and those with Swarthmore, University of Virginia, Georgetown, and Washington and Lee being defeats. Manager Wilson has arranged the following strong schedule for next season: October 6, Lehigh; October 13, Gallaudet; October 20, Swarthmore; October 27, Western Maryland; November 3, West Virginia University; November 10, Washington and Lee; November 17, University of Virginia; November 29, Georgetown. B. G. Steenerson served the team excellently as captain and has been honored with the captaincy a second time. R. C. Heflebower made a most efficient manager, arranging a strong schedule and ending the season with the finances in fine shape. One of the best players in the East, Mr. Crowell, captain of Swarthmore's team, has been engaged as coach for next season and everything points to an even more successful year.

Base Ball:—The base ball schedule this season was the strongest that the University has ever attempted, including the Navy, Lehigh, Columbia, Syracuse, Carlisle Indians, Washington and Lee, Georgia, Georgetown, University of Virginia and others. There were strong individuals on the team and at times the team played brilliant ball, notably in its victories over Virginia, Washington and Lee, Georgia and Lehigh, but often there was an evident lack of team work and a disposition to get "rattled" at critical moments. This was due chiefly to the lack of a coach and time to practice. Captain Bradley worked hard and effectively with the material at hand and did all that could be done under the circumstances. While the student attendance at the games was disappointing, yet Manager McEnery succeeded in ending the heaviest schedule ever played by the team in a better condition, financially, than has been done before.

Track:—Track work is the newest form of athletics at the University, last season being the first time that the team has attempted to participate in an intercollegiate contest, but the efforts of the team were very successful. It participated in seven meets and won places in each, the two-mile relay defeating Virginia and the one-mile defeating Johns Hopkins. The Freshman relay defeated a similar team from Georgetown, and Sterrett won in four contests in the pole vault, establishing a record for the

South. Captain Lorando has brought the name of George Washington into prominence in track work by his excellent running in the long distances, having won the mile, half, and two-mile races. The team participated in meets in Philadelphia, Baltimore, Norfolk, and Washington.

The University Rifle Club, organized in April, won two important victories. The Canoe Club has now a permanent camp-site, located at Broadwater, on the Potomac, and has planned for a Club House.

Publications:—The University Hatchet, our weekly newspaper, has been ably edited during the past session by the Editor-in-Chief, Robert I. Moore, and his staff. A corporation has just been formed known as THE UNIVERSITY HATCHET, with a board of directors, consisting of five students and two members of the faculty, who will in the future supervise the publication and insure student control. The Board, appointed for the first year by the President of the University, is as follows: Mr. Moore, Editor-in-Chief; Mr. Russell, Business Manager; Mr. Wilson, Mr. Gates, and Mr. Call, Professor Carroll, and Dean Vance. It is believed that the change from private ownership to student control, will add greatly to the excellence and influence of the paper. The Mall for 1905-06 which appeared in May is a handsome octavo volume in buff and blue, and shows marked improvement over the Mall of 1904-05. Mr. Robert I. Moore was Editor-in-Chief and Mr. E. C. Wilson, Business Manager.

Debating:—During the year two intercollegiate debates have been held, one with the University of Virginia and the other with the University of Cincinnati, in both the decision being unanimous in favor of George Washington. There have been six public inter-society debates among the Columbian, the Needham, and the Enosinian Societies, the Columbian winning from the Needham and one from the Enosinian; the Needham winning two from the Columbian and one from the Enosinian; in the Prize Debate during Commencement the teams were not distinctive. The University Congress has been continued in a prosperous condition during the session and is proving an excellent field for training, in extemporaneous speaking. The University has a remarkable record in intercollegiate debating, having won four debates in succession from the strongest teams without a single defeat, namely: Washington and Lee, Georgetown, the University of Virginia, and the University of Cincinnati.

Y. M. C. A.:—A Young Men's Christian Association has been organized among the students and active work already begun. The membership has grown rapidly and plans have been made to bring it into greater prominence among the students at the opening of next session. President Powers was sent as a delegate to the Students' Volunteer Convention and returned with added enthusiasm for the work of furthering the growth of the Association among the students.

Student Clubs and Societies:—Of clubs and organizations with intellectual aims, the Classical Club has enjoyed the most successful year in its history with 30 active members; it has held regular meetings at the houses of members and has had two public sessions with lectures by Professor H. L. Wilson of Johns Hopkins University and by Professor J. C. Hoppin, late of Bryn Mawr and the American School at Athens. The Dramatic Club has given two public exhibitions. The Architectural Club has had a series of illustrated lectures at its regular meetings. The Mechanical and Civil Engineering Societies have also had an active year. The Glee Club and the Girls' Glee Club have given frequent entertainments.

THE SECOND WINTER CONVOCATION.

The Second Winter Convocation of the University was held in the Belasco Theatre, Wednesday morning, February 22d, at 10.30 o'clock. The University Procession of the president, trustees, faculty and students, in academic caps and gowns, marched from University Hall to the theatre. The address was made by Hon. Leslie M. Shaw, Secretary of the Treasury, on the "Evolution of Self-Government." Degrees were conferred on fourteen candidates as follows: B.S., 2; M.D., 5; LL.D., 4; M.P.L., 1; M.Dip., 1; and M.S., 1. The music was furnished by the Marine Band. After the exercises, a luncheon was served by the Trustees at the Shoreham Hotel to the faculty and invited guests, and in the afternoon a reception in University Hall was tendered to President and Mrs. Needham by the Columbian Women.

THE EIGHTY-FIFTH ANNUAL COMMENCEMENT.

On Sunday afternoon, June 3, the baccalaureate services of the University were held in Memorial Continental Hall. The sermon to the graduating classes was preached by the Rev. Edgar Y. Mullins, D.D., LL.D., President of the Southern Baptist Theological Seminary, Louisville, Kentucky, from the text, "Thou hast put all things in subjection under his feet." (Hebrews 2, 8.)

The University Commencement occurred in the same place the following Wednesday, June 6, at 10.30 o'clock. The University Procession was formed at University Hall, and marched through Lafayette Park down Seventeenth Street to the Memorial Continental Hall. All in the procession, except the candidates for degrees, occupied seats on the platform. The invocation was pronounced by Rev. Samuel H. Greene, D.D., LL.D., Chairman of the Board of Trustees of Columbian College. President Needham then introduced the speaker of the occasion, the Rev. Denis J. Stafford, D.D., Rector of Saint Patrick's Cathedral, Washington, D. C., who delivered the commencement address.

The candidates for degrees were then presented by the Deans of the respective faculties to the President, who granted them their diplomas. There were in all 234 graduates, distributed as follows: B. A., 16; B. S, 7; B. S. in chemistry, 2; B. S. in civil engineering, 3; B. S. in electrical engineering, 2; M. D., 49; D.D.S., 12; Phar. D., 11; LL.B., 87; LL.M., 5;

M. P. L., 19; M. Dip., 1; C. E., 2; E. E., 2; M. E., 1; M. S., 5; M. A., 5; D. C. L., 3; Ph.D., 2. No honorary degrees were conferred. Scholarships and prizes were announced by the Deans. Meetings of the Trustees of the University, of Columbian College, and of the Washington College of Engineering were held in the afternoon. On Wednesday evening a reception at Rauscher's was given by the President and Trustees to the members of the graduating classes.

THE TRUSTEES' AND ALUMNI ANNUAL DINNER.

The most brilliant occasion in the University year was the Annual Dinner of Trustees and Alumni of the University, which occurred at the New Willard Hotel on the evening of March 14. Over 200 Trustees, Alumni, members of the faculty and invited guests were seated at the tables. The ladies of the George Washington Memorial Association and others came in for the coffee and speeches and were seated in the gallery. The banquet hall was decorated with American flags and the colors of the University. The gathering was representative in the large number of leaders in the intellectual and political life of the nation, who were present. The menu card had on its face a cut of the University flag, and on the second page the following legends:

"It has been my ardent wish to see a plan devised, on a liberal scale, which would have a tendency to spread systematic ideas through all parts of this rising empire, thereby to do away with local attachments and state prejudices, as far as the nature of things would, or indeed ought to admit, from our national councils. Looking anxiously forward to the accomplishment of so desirable an object as this is (in my estimation), my mind has not been able to contemplate any plan more likely to effect the measure than the establishment of a university. * * *"

George Washington In His Last Will.

"The Federal City from its centrality and the advantages which in other respects it must have over any other place in the United States ought to be preferred as a proper site for such a university."

George Washington's Letter to Commissioners.

"And so on this birthday of the Father of His Country I leave with you this thought: George Washington the testator, the people of the United States the executor, the bequest a university, its domicile this District, its field of toil the Republic, the reach of its ever-increasing influence and glory the boundaries of space and time."

Mr. Justice Brewer's Address at the George Washington University Convocation, February 22, 1905.

The addresses all had one common end in view, and this was most happily expressed by President Needham: "To learn what great universities are effecting at the capitals of other nations, what they are accomplishing at the capitals of states, and what the George Washington University may be expected to do as a university of a national character, non-partisan, non-sectarian, non-political, to incarnate the principles of the greatest American, George Washington, and to do honor to his memory by the search for truth in all departments of learning, has been the purpose tonight of this gathering." Hon. H. B. F. Macfarland, Commissioner of the District of Columbia, acted as toast master and introduced the speakers, who were as follows: His Excellency, M. Jusserand, Ambassador of France to the United States; Hon. Andrew D. White, ex-President of Cornell University, and late Ambassador to Germany; Hon. J. Q. Cannon, Speaker of the House of Representatives; Professor Richard C. Ely, head of the Department of Economics and Political Science in the University of Wisconsin; and President Needham. Letters of regret were read from Hon. Elihu Root, Secretary of State, and others. The speeches and letters abounded in expressions of confidence and good will toward the University in its larger policy, and from them we shall quote a few characteristic sentiments:

MR. MACFARLAND:—"We have George Washington for our spiritual father, and so have a right to bear his great name. We are aiming to obey his last command to establish a national university in the national capital, which will be worthy of the nation which he created. What has already been done by us, and what is planned for the future has only to be known to secure the moral and material aid required for complete success. So modestly has President Needham done the work of reorganizing the University and planning its new career, providing it with a new spirit far more important even than a new site, that it has seemed necessary at this time to publicly state the progress made, and the plans for the future. We are confident that the University, now so strong, with its fine faculty, its 1,600 students, its unexampled spirit, and all the opportunities of the national capital, the natural place for a university and for research work, and already rich in the good will of this community in which it is located, will have the sympathy and support of patriotic and public-spirited Americans everywhere. The interest in the national capital and the desire of the people of our country everywhere to see it developed and embellished will not be ignored in the case of this University. The national life, informed and inspired by it, must find the crown of its expression at the national capital and in a university national in character, where ardent students, from all over the country, may behold 'the bright face of truth in the quiet and still air of delightful studies.' "

SECRETARY ROOT'S LETTER:—"I should have been glad of the opportunity to express my hearty approval of the work which the University is proposing to do in Washington, especially in politics, economics, international law, and diplomacy. The importance of having a large number of men thoroughly educated in these respects, grows continually, with the increasing complications of modern life and government and international relations. Questions of internal government are becoming less simple and more difficult of solution, and there is more need that they should be thoroughly studied than ever before. Questions of peace or war are determined now by great masses of people forming popular governments, according to their opinions and feelings about supposed injuries and insults. It is of the highest importance that the people who really determine such questions shall have a correct view of what their international rights and duties are. The surest way to secure permanent peace, founded upon just conduct, is to have such an understanding, and the surest way to secure that is through the kind of work which your University is proposing to do. I know of no place in the country which has such great advantages for the prosecution of this work as the national capital."

M. JUSSERAND:—"A city which bears the name of Washington and a university which bears the name of Washington are bound to be great, noble and beautiful; to be the pride of the country. * * * Universities must, to be sure, produce all sorts of men; else they would not justify their name; but it is quite natural that each should pay more attention to one special kind of knowledge. Let others then choose, as their specialty, literary training, scientific training, or commercial training. The George Washington University can not hesitate and has no choice; it will become famous and be of use to the country, in being a nursery of magistrates, statesmen and diplomats. * * * A friend and guest of this town, and of this Republic, I can form no better wish for your University than this: 'May it be as successful as the *'Ecole des Sciences Politiques'* has been in France, may it prove so useful to the United States in their prosperity as that was to us, *'patriae tempore iniquo.'* May we soon see the day when young Frenchmen, returning their American friends' compliments. will come here, and study your great country, her organization and institutions, at the George Washington University, famous then the world over.' "

DR. WHITE:—"I count it a great honor to be asked in this place and presence to discuss for a few moments the great question which occupies all your minds, and which has so long, in various ways, occupied the minds of the most earnest men in this country. I need not remind you that as long ago as the time of him, whose name this University bears, the thought had entered deeply into the minds of our foremost men. More eloquent by far than any words which I can utter are those which I find printed on the menu for this evening. The committee in charge of this dinner did well in printing the words of Washington, and at the same time coupling with them the most eloquent tribute paid to him by my friend and colleague, and schoolmate, Mr. Justice Brewer. Nor need I dwell on the fact that so long a line of presidents of the United States have endorsed the plan of a university at Washington; nor is there especial cause to discuss this evening another fact of capital importance, which is that never has any plan for advanced education in the United States received such universal, such earnest and such devoted approval as the

425819

First Floor:—A dining room or commons will be the chief feature of this floor, either extending through two stories, with an area of about 5,000 square feet, or modified so as to give a large commons with an area of about 3,000 square feet and a smaller dinning room communicating with it with an area of about 2,000 square feet. There will be ample serving rooms, pantries, etc., adjoining the dinning room to be provided with dumb waiter and service stairs to communicate with kitchen, kitchen pantry, etc., which will be located in the sub-basement. There will also be room on this floor for parlors, smoking rooms or reading rooms.

On the second floor, it is desired to have as many chambers as can be obtained on this floor, with the necessary bath rooms. Some of these will be occupied by the students, but others will be reserved for the use, at a moderate rental, of visiting members of the Alumni Club.

The cost of the building and furnishings is estimated at $150,000.00. The Alumni have pledged themselves, by formal vote, to raise this sum, both by making such subscriptions as personal circumstances will warrant, and by using their influence among their fellow alumni and other friends to obtain additional subscriptions.

As a result of a preliminary and short canvass already made, subscriptions have been made by more than 100 alumni, in amounts ranging from $10 to $1,000 and aggregating about $7,500.00 If the alumni who have not yet been asked for subscriptions were to respond in the same ratio, the amount required would be raised.

It is known that but few of the alumni can be called men of wealth, but it is felt that all will be willing to make a contribution, even though a small one. These subscriptions may be made payable in annual installments during a period of five years, and a contribution is desired and asked from every alumnus. Let it be truly an ALUMNI Hall.

Now is the time for every loyal alumnus to express in a substantial way his devotion to Alma Mater. Subscriptions may be sent to Professor H. L. Hodgkins, Secretary of the General Alumni Association, The George Washington University.

VOLUME V NUMBER 3

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DEPARTMENT OF MEDICINE NUMBER

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OCTOBER, 1906

DEPARTMENT OF MEDICINE NUMBER

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EDITORIAL NOTE.

The GEORGE WASHINGTON UNIVERSITY BULLETIN is published four times a year, under the editorial supervision of the Board of University Publications, appointed by the President's Council. It is the purpose of the Council to make the BULLETIN an organ of the educational and scientific activities of the University. The University Catalogue constitutes one number. Others are devoted to information of special interest to the Alumni and patrons of the University. Scientific numbers are published from time to time containing contributions from instructors and graduates, and information regarding books, monographs, and papers published by them under other auspices.

The present Scientific Number is devoted especially to the Department of Medicine, and a number of papers are presented from members of the Faculty and Alumni, most of which were read before the University Medical Society. It also contains notes bearing on investigations and researches being made by instructors in this department, announcements of recent appointments, and miscellaneous items of University interest. The Board desires to be kept informed as to the academic record, publications and professional appointments of instructors and graduates in all departments of the University. Communications may be addressed to the Director.

The thanks of the Board are gratefully extended to Dean Phillips, of the Department of Medicine, for his helpful co-operation in the preparation of this number.

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The George Washington University
BULLETIN

VOL. V OCTOBER, 1906 No. 3

THE INFLUENCE OF AMERICAN SURGERY ON EUROPE.*

By Carl Beck, M.D. Professor of Surgery in the Postgraduate Medical School, University of the State of New York, President of the St. Mark's Hospital of New York.

In order to realize fully, what American Surgery has achieved, so far, and how it compares with that of other countries, it will be opportune to go back to ancient times.

The earliest surgical records come from Egypt. In the papyrus found by Ebers, the great German Egyptologist, which was written 1552 B. C., a section, dealing with tumors on the surface of the body, reads: "If this tumor comes and goes under your fingers, trembling even when your hand is still, say—it is a fatty tumor—and treat it with the knife, after which treat it as an open wound." It is maintained, that the old Egyptian embalmers had considerable anatomical knowledge which entitled them to act as "dressers of wounds," that is surgeons. The fact exists, that the Egyptians had a treatise on anatomy. According to Manetho this was attributed to Athothis, son of Menes, who reigned in 5241 B. C.

Specimens of Jewish surgery are found in the Talmud, the rabbis being acquainted with methods of suturing wounds, trephining, supplying the loss of substance.

Of Indian Surgery, the Charaka-samhita, the oldest medical work in existence, tells us many interesting facts. It is deplorable that the Sanskrit text of this work was only translated shortly ago. The Charaka-samhita was probably written in 1000 B. C. Another well-known Indian book, composed somewhat later, is the Susruta. These works contain a list of complicated surgical instruments, among them are such recommended for amputations, for lithotomy, the treatment of fistulae, polypi, sores, ascites, inhalation for cough and dyspnoea, obstruction of the intestines, etc.

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*Address read at the first Fall Convocation of The George Washington University in Continental Memorial Hall, October 17, 1906.

The immortal songs of Homer which supposedly were written at the same period, often allude to surgery. The nomenclature is nearly identical with that given by Hippocrates. The arrow wound inflicted on one of Nestor's horses by the bow of Paris is most scientifically described. It was at the top of the skull and had apparently penetrated the brain, which fact was diagnosticated from the symptoms, the wounded horse having convulsions and turning round and round the pole.

Aristophanes, the great poet with the loose tongue, describes the slave of Lamachus as he calls for compresses dipped into hot water wherewith he intended to treat the sprained ankle of his master.

If we study the fragments of the various writings of great Hippocrates, who was born on the island of Kos, in the year 460 B. C., we are so much surprised by the success of surgical operations performed under so many great difficulties at that period, when anesthesia was unknown, that it can be well understood that some are still inclined to doubt the authenticity of the records. The Hippocratic oath, a document of the highest rank in the history of civilization, indicates the necessity of observing the most scrupulous cleanliness and foreshadows some knowledge of aseptic rules.

Faithful as the reproductions of the classical sculptors and poets were, whose creations are still a model of keen insight into nature, stripped of fanciful and glittering flights of imagination, no less painstaking was surgery at this period, where the natural phenomena were carefully and truthfully studied by actual experiment and demonstration.

The head of the Cnidian School, Euryphon, who was a contemporary of Hippocrates, analyzes the evils of overeating most thoroughly, and as if he had foreseen the modern stomach, advises artificial vomiting for the purpose of testing the different degree of digestibility of the various kinds of food. Thus he has in fact inaugurated the "test-meal," this less aesthetic than powerful weapon of the hypermodern stomach-specialist.

In this glorious period the surgeons were held in high esteem. One of the indications of their high standing may be found in the royal fees they received. The annual salary of Democedes of Croton, from the city of Athens, from the commonwealth of Aegina, and from the Samoan tyrant amounted to 8,000, 10,000 and 16,000 drachmae, that is $1,600 $2,000 and $3,200. When Democedes was captured by the Persian King, Darius, the highest honors were conferred upon him at the the royal court where he finally acted as confidential adviser of the famous ruler.

The great Roman people developed the art for which Egyptians and Greeks had laid the foundation. The era of the Roman Emperors developed a number of brilliant surgeons, among whom Antyllus, Heliodorus, Leonides and Archigenes, may be prominently mentioned.

Only fragments are left of this admirable knowledge in the abstracts of Aetius and Oribasius, later of Paulus of Aegina. They appeal to us like the torsos of those magnificent antique masterpieces at whose overwhelming beauty we are now only able to guess. Surgical operations were performed at that period which simply astonish us.

A slight indication of what must have been lost of the immense knowledge of the great Hippocratic era, and how advanced the technics of Roman surgery must have been, may be gleaned from a visit to Pompeii. On my repeated visits to this most interesting place, it struck me that the peculiar construction of the House of the Surgeon, so well known to the readers of Bulwers "Last Days of Pompeii," pointed to more or less developed aseptic principles. The streams of water constantly flowing through the streets of Roman cities were certainly apt to remove bacteria or at least much of their favorable soil of development, and the large number of small wells in the house of the surgeon suggests, that the wounded as well as the instruments and dressings were subjected to a very thorough cleaning before and during operation. This would be in harmony with the advice of Hippocrates to frequently wash the patient before performing an operation. I can fully understand why these old masters with their fine art of diagnosis and their powerful weapon "cleanliness," have obtained much better results than the surgeons of not many years ago, who went to the operating table directly from the autopsy room, after having washed their hands in a questionable fluid, repeating their dissecting art on the living subject which thus frequently became a premature specimen for the autopsy room.

The surgical instruments excavated at Herculanum and Pompeii and exhibited now in the National Museum at Naples, are all of the most admirable perfection. There are many apparatus which many a spectator thought to be devised only half a century ago. But they existed before the advent of our Lord. *Tout comme chez nous.* The instruments all being made of steel or of bronze, are naturally aseptic.

With the downfall of the great Roma surgery took a speedy decline. Only the chevaleresque Arabs learned antique culture from the direct translation of Greek sources or indirectly through Syrian and Hebrew traditions. But these gallant savants handled words better than the scalpel and with the only exception of practical Abulkasim were not talented for surgical technicisms.

The surgical literature of the Arabians being gradually translated into Latin, became known to the Christian occident, where intelligent monks, who indulged in the study of natural sciences, took an interest in it and spread it. Among these highly creditable men Guilelmus Placentinus, Hugo von Lucca, Brunus Longoburgensis, Theodericus, the bishop, Lanfrancus and especially Guido de Cauliaco, must be mentioned. But they were situated like the preacher in the desert, and as a whole surgery was held in so little esteem that it became a rule among the German Mastersingers of this sad period, not to accept an apprentice or disciple, until he could prove, that he was fourteen years of age, of decent parentage and "in particular, not related to any clerk, hangman, *surgeon*, or similar individual."

But fortunately, the long cheerless mediaeval night was followed by the dawn of the Cinquecento, the same merry period which gave great Christopher his chance to discover us. This era, so justly called the Renaissance, stirred up minds all over the world. Antique culture was studied in its original diction again. Old inveterated dogmas fell to the ground and criticism came up, and with it also, the Renaissance of Surgery began. The genius of fearless Andreas Vesalius of the German town of Wesel convinced Carl V, the German Emperor, that anatomy was the foundation of surgery and that unless the government would permit of dissection for scientific purposes, surgery would remain a living lie.

That day in fact, on which autopsies became legitimate through the Hidalgo-philosopher on the German throne, marks the resurrection of surgery.

Now the splendid epoch stamped by the genius of French surgeons, followed. Ambroise Paré reintroduced the ligature of the blood vessels, his large experience on the battle-field also enabling him to advise a more simple kind of treatment of gun-shot wounds. Surgical schools were founded in France, J. L. Petit, in contradiction to his name, becoming the greatest representative of the surgery of the eighteenth century, Désault founding the first surgical clinic, and Larrey, of whom a Napoleon said that he was the only living man whom he ever respected, showing us the greatest and noblest of all military surgeons. The largest influence upon the surgical world was exerted by Dupuytren, however, who was not only the great master of the scalpel, but also excelled by his thorough understanding of pathology, which was at his time in its infancy.

While the French were on top, our English brethren were by no means lazy. Nearly three hundred years ago Harvey detected the circulation of the blood vessels. In John Hunter we see the great surgical pathologist of the eighteenth century, and in Astley Cooper and Spencer Wells the bold but conscientious operators. The greatest blessing which the surgical world received from Great Britain, however, was the antiseptic wound-treatment inaugurated by immortal Lister.

In Germany the far-seeing eye of Vincenz von Kern gave us the open wound-treatment, the principles of which have come to honor again. Scientific pathology, born in the same country, brought reforms, which, like monuments, *aere perennius*, will forever stand in history. The theoretical reflections of Rokitansky, Skoda, Helmholtz, and Virchow were soon utilized in practice by surgical masters like Dieffenbach, the father of plastic surgery, by Stromeyer, Von Langenbeck, von Esmarch, Volkmann and Billroth. The discovery of the Roentgen Rays, which revolutionized some of the most important departments of surgery, has also added new lustre to the German laurels. The highly developed university life favored the universal direction of the minds, so characteristic for the nation of thinkers and dreamers, their tendency to deepening of thought and their admirable endurance in methodical work, were factors which made Germany the center of pathological science, this great fundament of modern surgery.

Still, the art of surgery could be practiced only under the greatest technical difficulties on account of the pain the patient had to endure during an operation. Long procedures could not be carried out at all, therefore the manual skill of the old surgeons, who were forced to perform their operations with the greatest possible hurry, must have been enormous and calls for our highest admiration.

It is assumed, that in ancient times anodynes were known. The potion, which the Trojan Helen was able to brew so well and mischievously, was supposed to banish care and dispel depression. The women of Thebes prepared the "Extractum Thebaicum, irae et tristitiae medicamentum." It is reported of Julius Caesar, that before he escaped the pirates, he put them to sleep by dropping a narcotic into their wine.

How far these reports are true, cannot be proven. It is certain, that at a remote period we see a manifold interest displayed in the study of bodily pain and its alleviation.

During the classical age, which left us the most wonderful expression of physical pain in the matchless Laokoon-group, bodily pain was frequently represented on the stage.

But there is no indication that ever before a surgical operation was performed during which the patient did not suffer the horrid agonies of combined physical and psychical pain, until it was reserved to the United States of America, to give the world that immense blessing, anesthesia. The discovery of sulfuric ether in 1846, as a safe means for making a patient senseless without any danger to his life, brought more progress in a few years than thirty centuries had brought before. Operations could be performed now, the possibilities of which our ancestors could hardly dream.

The name of the discoverer, Dr. W. T. Morton, of Boston, should be a household word through the entire civilized world. But, alas, there is hardly one non-medical man who knows even the name of this greatest benefactor of suffering humanity.

Nothing illustrates the peculiarity of human nature more clearly than the deplorable fact that the public at large ignores such men. Public squares are ornamented with the statues of generals, whose victories were sometimes won in spite of rather than because of their abilities, or simply by the bravery of their subordinates. The truly great hero, who has sacrificed himself to find the means of preserving lives instead of destroying them, is forgotten; while the least thing gratitude could do for him would be to erect a monument in every village of the earth.

To those of our European confrères, who are still endeavoring to belittle American achievements, it may be said, that if America had contributed nothing else than anesthesia to surgery, it would have done well enough.

But it has contributed a great deal more. It is true, in general the United States could not parade with their medical education of thirty or thirty five years ago. Preliminary education was not obligatory and more than one brave Agricola metamorphosed, like great Cincinnatus, who was called to the head of the army from his plough, into a faithful son of Hippocrates over night. Only eighteen years ago any candidate could even in the best eastern strongholds of science be promoted to the degree of an M. D., after having studied for two years. We may be somewhat ashamed of that period but at the same time, we can well boast of the rapidity with which the change to the better was made. It would have taken a century in the old world to accomplish that progress which was made here in a decade.

And if the whole truth will be said, then our criticizing colleagues in Europe must not only accentuate the state of cloudiness, ignoring the bright sun-rays which were shining even through the darkest epochs of American history.

It is true, American medical training is still briefer than European. But even when American physicians graduated after a two years course, they knew well that their training was incomplete and the majority tried hard to perfect themselves. Most of the European physicians went into practice after four years study then; but many of the Americans became assistants in hospitals, or practiced under the auspices of an experienced physician several years, thus doing voluntarily what the law might well have required. Today the plan of study in American medical colleges embraces a term of four years, while in Germany, France and England it is at least five. Now, while this is a year more, we may emphasize that the American student really studies and loses no time in libations and duels. The control which the recitation scheme exerts compels him to stick to his work. This, perhaps, makes him somewhat too solemn, while the average German student represents the other extreme. The American student might well absorb some of the poetic qualities of his hilarious German confrère, while the German student would be benefited by adopting some of the more business-like methods of his transatlantic commilito.

Of course, the great European institutions, especially those of Germany, England and France, serve as models in many respects. They are well endowed by the government and the professors do not go into the fight for existence. Still, not meaning to belittle their admirable work, the question might not be out of place: How would it compare, if they had to make a living from their practice, at the same time? We deplore this fact, but we cannot help admiring the American medical soldier who fights his daily battle at the sick bed, and still has enough energy left to spend the midnight hours at the laboratory, while every new problem he solves is intended to prevent disease, and thus to lessen the earnings of his own profession. Is there anything less selfish in this world? Common sense appreciated long ago that the medical scientist and teacher should be more independent from practice; yet it may be doubted whether a teacher who is not at all engaged in practice will be best fitted for instruction after all. The teacher must never lose sight of the fact that whatever his research may tend to, it must always be to the benefit of human beings, if he does not want to lose his vital relation with the greatest of all professions.

It is true, that to the extraordinary thoroughness and perseverance characterizing German investigators, the medical sciences are greatly indebted. On the other hand, a great deal of time and opportunity has been wasted by this praiseworthy quality on trivial subjects. Virtue may become a fault, sometimes, as Goethe says: "Wohlthat wird Plage." No American could, for instance, be found who would devote a lifetime to write six volumes on the iris of the viper. It was reserved for a German investigator to display such loving interest in a snake.

The motto of the American is utility. Where he sows he expects fruit. He has a keen eye for the "proficit and deficit." This, also, is both his virtue and his fault. No wonder that he astonishes the civilized world—not only in surgery—by the brilliancy of his technics. Theory is not the sphere he enjoys; it is practice. Goethe may have thought of the American when he says in Faust:

> Grau, theurer Freund, ist alle Theorie
> Und gruen des Lebens goldner Baum."
> (Gray, my dear friend, is theory,
> But ever green, life's golden tree.)

And while Germany will probably keep its leading position as far as the theoretical branches of medicine are concerned, the United States will become authoritative in practice. Asepsis, the daughter of antisepsis, while the result of the research of Pasteur, Lister and Koch, was methodically introduced into practice by von Bergmann. But the greatest perfection of the new method has an American trademark. Nowhere are aseptic technics so commonly practiced and so perfect as in the surgical strongholds of the United States. The natural cleanliness, so characteristic of American habits, has of course been a most favorable element for the introduction and appreciation of aseptic principles.

The American nation is acknowledged all over the world as the cleanest. It is therefore not astonishing that asepsis has been more highly appreciated here than anywhere else, and it is easy to understand that this country is destined more than any other nation to develop asepsis to its fullest perfection.

It is safe to say that in many respects the United States have fulfilled a noble mission in this direction for many years, a task not to be underestimated. There are a number of signs indicating that this characteristic sense for cleanliness has, like some other American virtues, influenced other countries indirectly. What a change, for instance, is observed in immigrants who come from semibarbarous districts, where even an annual bath is regarded as an extravagant and foolish luxury. They sometimes carry all imaginable varieties of mother earth, especially on those surfaces of the body not covered by clothing. When they scratch themselves for obvious reasons they become self-inoculated with the germs harbored in their well cultivated filth. As bacteriological investigations prove, all sorts of pus-producing germs are found in their skin; so it is only too natural that the skin surface of such individuals is covered with boils and swollen glands. The example of their new fellow citizens soon teaches them a good lesson, and in the second generation the sense of cleanliness is generally very well developed.

Of course, there will always be some who are never able to be thoroughly clean, no matter how often they are admonished. Originally, it is true, such virtues arise more from a trait of character than from education. Some, so to say, are born clean. Still education does a great deal. The youngster always reflects the mother more or less. If he is clean, there is little doubt that his mother took pains in teaching him how to clean his hair, his finger-nails, the sole of his foot, his mouth, and his clothing. And external cleanliness often is the reflection of the purity of character. Tell me who your mother is and I will tell you who you are.

And most important is this virtue in the members of the medical profession. A physician whose exterior is not absolutely clean should be invariably rejected by his patient. If his finger-nails are not scrupulously clean, the same hand which should be destined to destroy disease is apt to produce it.

There is even among the commonest American people a natural sense for asepsis, similar to that in the old Roman sister. This accounts for the enjoyable fact, that the American patient so-to-say enters the atmosphere of the operating room in a kind of aseptic disposition.

It is by no means surprising therefore that the mortality rate of some American surgeons to-day is lower than that in any other country, the mortality in some of the important abdominal operations descending to less than 1 per cent.

But there are still more sun-rays in the history of American surgery, which, I feel justified to say, reflects the extraordinary history of this country. Many such rays were shining even during the interregnum, that much criticized period, because medical men arose whose names will never vanish from the medical history of the world. We may only mention the names McDowell, Warren, Sims, Mott, Parker, O'Dwyer and Corning. Europe should not forget, that at the time when French surgery was at its zenith, when French professors dictated the surgical fashions, when Dupuytren, the greatest surgeon of his time, refused to be operated on, saying that "he would rather die by the hands of God than by those of his colleagues," the genius of the simple American country physician, McDowell, broke the prejudice of centuries by performing the first ovariotomy. Dupuytren had strong reasons for his despondent standpoint, because he suffered from a pus-chest and among fifty operations, carried out by him for this condition, forty-seven were unsuccessful. To-day, thank God, the proportion is reversed.

It was shortly afterward that Valentine Mott astonished the surgical world by his ligation of the arteria innominata.

Modern gynecology is the creation of Marion Sims. He was a country physician, like his southern colleague. McDowell, and like the great German, Robert Koch, who was a village doctor until his forty-fifth year, his immortal experiments, which showed the tubercle bacillus to be the cause of the most important human disease, having been made far away from, and uninspired by, great university centers. It was O'Dwyer who invented laryngeal intubation; Corning is the father of spinal anesthesia; Senn's intestinal suture is used, and Murphy's method of uniting the intestines by his ingenious button, is practiced all over the world.

And what would the knowledge of the most important abdominal disease be, had American ingenuity not lifted the veil from the pathology of the vermiform appendix and exposed its mischievousness?

The old world was always used to give us, but in reference to the knowledge about appendicitis it had to receive from the young transatlantic giant. The American perspective is now being accepted by the European surgeons, their views becoming greatly altered at last. How the majority stands now, may be illustrated by their attitude during a discussion of one of the leading medical societies of Germany, which I had the privilege to attend.

The discussion on appendicitis, which was inaugurated by the Berlin Medical Society on July 18th, attracted so much attention in fact, that its distinguished President, Professor von Bergmann, was induced to call two subsequent meetings for the exclusive debate upon this special subject. Most of the eminent teachers of the Berlin University participated, among them Olshausen and Landau, the gynecologists, Kraus, the greatest German internist of the present day, Henoh, the pediatrist, Ewald, the enterologist, and the surgeons Israel, Krause and Rotter.

Almost all pleaded in favor of early surgical interference. Although it was most gratifying to hear the same views expressed, for which many American surgeons have been fighting for the last twenty-five years, it was disappointing to find that no allusion was made to their immortal merits in this respect. As this omission was pre-eminently based upon the traditional European ignorance concerning medical events in the new world, I was glad to avail myself of the chance offered to me by the kind invitation of the President, to congratulate the distinguished society on having become so thoroughly Americanized in the question of appendicitis.

Especially did I emphasize the fact that a glance over the tremendous literature of this most important part of the surgery would reveal that until a few years ago the early operation for appendicitis was regarded an adventurous policy in Germany. "Only an American would do such a thing," a celebrated surgeon in Berlin said to me not more than eight years ago, when I tried to convince him that the apparently mild symptoms of this disease were frequently misleading and often contrasted greatly with the severe pathological condition of the appendix.

This knowledge, that in the majority of cases it is impossible to make an accurate diagnosis as to whether there was a so-called catarrhal appendicitis or a beginning perforation, was gained by American surgeons who learned the facts from their frequent autopsies in vivo. That the infection was much more dangerous than the well guarded scalpel, is an American axiom. That early interference, even with the risk, that once in a while, an unnecessary operation may be performed, is the safest procedure, was proven by the extremely low death rate of such American surgeons, as were given an early opportunity to operate by the family physician.

It was the genius of an American surgeon, which introduced the most important diagnostic factor in appendicitis, McBurney's point, into medical science. American surgeons, like Senn, Weir, Bull and Murphy, were the pioneers and advocated the necessity of removing the appendix during the free interval, that is even after a patient had recovered from an acute attack, because they realized that with a few exceptions the disease had passed over into the chronic stage only. It is perfectly true that to the Germans belongs the credit for first having given a correct scientific description of the inflammation of the vermiform appendix. But they missed the causal nexus entirely, attributing the pus-accumulation in the right iliac fossa to an inflammatory process in the loose connective tissues which surround the caecum. It was not more than logical therefore that they gave this condition that fatal term "perityphlitis."

The first description in 1830 is from the pen of Goldbeck, under the auspices of his teacher Professor Puchelt, of Heidelberg, the same celebrated university to which we are indebted for the first description of cholelithiasis. (Loewenberg in 1554.)

Less than thirty years ago great Friedreich of the same old alma mater taught, that perforation of the vermiform appendix might be caused by the irritation induced by a grape seed, this occurrence always leading to death. Fortunately he claimed this kind of "ulceration" was extremely rare, inferring from the fact that he had not seen more than two cases of this kind. When I then, jurans in verba magistri, attended these lectures as a student, I hardly thought of ever seeing more than a few cases during my surgical career, while the more mature knowledge I had the privilege to obtain in this country enabled me later to remove more than a thousand appendices. Although Schmidt as early as 1847 came very near describing McBurney's point by calling attention to the peculiar intensification of the pain produced by pressure in the caecal region, emphasizing at the same time, the fact that the area of pain hardly exceeded the size of a nickel, none of these great thinkers, strange to say, thought of the most obvious indication of attacking this area directly.

In spite of the most convincing proofs brought by American surgeons in favor of early interference, the Germans, otherwise so progressive, until recently remained obstinate in their so-called conservative treatment of appendicitis, which, in other words, was nothing but a peculiar form of therapeutic nihilism. It is remarkable that the same men to whose genius we are forever indebted for the elementary knowledge of the surgery of the alimentary canal, liver and kidneys, were so long perplexed by the appendix. Let us be grateful that the nation which produced a Kant, the man of the categoric Imperative, has at last begun to respect the little treacherous rebel. American surgeons do not imagine even now that they know all about appendicitis. They have still left a good deal to their European confrères for further development, and no doubt they are justified in expecting especially, much from the theoretical research of German scientists.

The etymological conscience of the great Berlin society was again disturbed by the Greek ending of the Latin word, a union, which they regard as a misalliance. The terms perityphlitis, perityphlitis appendiculas, epityphlitis, scolecoiditis were again proposed for substitution. It is true that all these terms are irreproachable from an etymological point of view, but as to their real meaning they are absolutely misleading. The term "perityphlitis" has done incalculable harm, as it greatly diverts the mind from the real source of the evil, while the term "appendicitis" means exactly what it signifies. And moreover the whole world has become accustomed to it. Therefore the "term-scavengers" will have to swallow the pill after all, whether they like it or not. In German it may be compared with indulging in onions—Man weint dabei und isst sie doch.

Usus est tyrannus! They should remember that medical etymology shows a large number of more or less euphonious terms, which are unjustifiable or even senseless. Bronchus means passage for beverage Arteria airpassage, Parenchyma, effusion, Muscle, little mouse, and we are so much used to them and know their meaning so well that none of us would seriously consider proposing their abolition. The etymological autodafé on the part of the term-scavengers made the word appendicitis only more popular. We may predict that the American term will be used all over the world as long as there shall be a human appendix.

Especially the German term-scavengers should consider that the language of Goethe, Schiller and Lessing contains words which are nothing else but ungrammatical nonsense. And they are by no means compositions of foreign words, nor do they represent one of those special medical terms, which are so sarcastically rated by our good friends the philologists. No, they are used by them in every day language without any scientific rumination.

Is there for instance, a greater absurdity, than the German word "Bediente," which means exactly the opposite of what is meant? The "Bediente" in fact is the master, he is the individual who is served, not the one who is serving. But this term is still better liked in literature than the simple and correct "Diener," as if this word gave him a kind of an aristocratic odor.

"Ein bedienter Soldat" is just as wrong. In some German universities the term "Chirurgischer Instrumentenmacher" can be witnessed from the windows of the auditorium of celebrated philologists and in Berlin numerous "Bohemian Fruit Stores" are found, although a fruit store in the capital of the German empire must naturally be German.

It is not the maker who is surgical, but the instrument, and it is not the store which is Bohemian but the fruit. To the same etymological jurisdiction belongs "der duerre Zwetschgenhaendler."

The proposition of Professor Kraus, to request the government to demand more particulars as far as the statistics on the morbidity as well as the mortality of appendicitis are concerned, fell on fruitful ground. The Secretary of State, who honored the meetings by his presence, promised to see to it, that every German physician should be provided with question blanks for the purpose of entering the details of his experience, especially regarding diagnosis and operative treatment of appendicitis. In this respect Germany may serve as a model, and while the American physicians do not need as much elucidation in reference to appendicitis as the German, it will be of general benefit were they to adopt the same plan.

Another sign of American influence is found in Berlin. There the physiognomies of the good old Charité, the venerable temple of Aesculapius of the Berlin University and its neighbor, the anatomical institute, have greatly changed since last year. A score of large, modern buildings was erected, Orth's pathological institute, Hildebrand's surgical, Henoch's pediatric and Lesser's dermatological clinics simply representing the best and most progressive institutions of their kind. There is in fact a remarkable combination of architectonic beauty and general usefulness.

The greatest progress, however, being made in Berlin at the present time is represented by the new anatomical institute. No American should fail to visit it, not only because it is a real delight to look at it, but especially for the reason that its construction is based upon American ideas.

We have all reason to be proud of the fact that Professor Waldeyer, the greatest anatomist of the present age, who has instructed most of our eminent teachers of anatomy, gives full credit to the excellence of the American institutions which he had visited twice during the last few years.

"The Americans" such are Professor Waldeyer's own words, "are ahead of us Germans in many respects. The idea of placing kitchen as well as operating and dissecting rooms under the roof, wherever it was practicable, struck me as an extremely good one and I made up my mind at once to persuade the Prussian government to adopt the American plan in the construction of the proposed new anatomical institute, that is, to provide for abundant light from above as well as from the side."

"How can we draw students from America, as long as our dissecting rooms are dark and antiquated, while the new world is so far ahead of us in this respect?" was the argument, which convinced the Prussian Minister of Education after a long struggle.

The immense building is now almost completed. There are four large rooms or rather halls, which permit of simultaneous dissecting by 400 students. The space in fact is now so ample that each of the students of the second course, who have to dissect vessels, nerves and the sensorial organs, has his own table during the entire year.

Like Professor Waldeyer, who has become so true a friend of this country, many great European scientists have visited us. The International Congress of 1904 in St. Louis brought no less than one hundred and forty illustrious men from the other side to these shores. All were full of praise and if men, like Helmholtz, von Esmarch, Czerny, von Winckel, von Mikuliciz, Lorenz, Tillmanns, Escherich, Trendelenburg, Orth, Harrison, Segond and Faure asserted that they could not help learning a great deal during their visits in America we may safely believe that this is not merely a courteous phrase. The great European scientists who studied this country by personal inspection, are all admirers of it. It is only the small man, who enjoys belittling whatever comes from America. "What good can come out of Nazareth?" those idiots say.

Ewald, another celebrated visitor, wrote in an editorial of the Berlin Clinical Weekly four years ago: "How long may it take till we must go to the United States, as the engineers and men of industry had to long ago, to accumulate new scientific knowledge? Then the scientific exchange will not be one-sided but mutual."

The time has come. Where else is there a country with such immense resources and the ambition and the brains to utilize them? Where else is the spirit of liberality which receives the foreigner like a brother? The dawn of a new and glorious scientific era can be well perceived on the American horizon.

Yes, the time of reciprocity, for which we hoped so long, has come. Let us compete with our European confreres by mutual exchange. Let us visit Europe as frequently as possible and let the Europeans visit us. Let them give us their refined knowledge, based upon classical and fundamental research, and let us show them the splendid technical achievements which are so characteristic of the United States. If anything can help to secure eternal peace between the nations it is the strengthening of their scientific ties.

THE STUDY OF THE PHYSIOLOGICAL EFFECTS OF CHEMICALLY RELATED SUBSTANCES. *

By Charles E. Munroe, Ph. D., Professor of Chemistry and Toxicology

Through your kind consideration it was my privilege to be present at the initial meeting of this body when the objects sought were set forth, its plans formulated and its organization perfected, and as one who has been long connected with the University, I was much gratified to find that you had caught the spirit which now pervades our Alma Mater and had given expression to it in the best possible form by bringing together a body of its graduates for the promotion of professional study and the interchange of information and of the results of experiences. Admitted thus to this association, it is my desire to contribute so far as possible to its advancement and though my own profession is and my training has been in a different field, I may, perhaps, be permitted to urge you in the larger interest of your profession and for the credit of your Alma Mater to lend the influence of this society to fostering original research on broad lines, independent of professional applications, and carried on in so exhaustive a manner that the results will be distinctive and significant.

Every one of you can undoubtedly point out special and attractive fields for research, which, properly cultivated, would yield valuable results, for your profession is so many-sided and so all-embracing that it presents problems for solution at every point and furnishes opportunities for men of widely varying capacities and equipment to do useful original work. Naturally the field which I would advocate and urge you to cultivate is that one where the professions of chemistry and medicine meet.

From remote times the animal, vegetable and mineral kingdoms have been drawn upon to furnish curative agents for bodily ills. We now know that from each of these sources substances may be obtained which have a decided action upon animal organs and functions, but until very recently these materials have been used in a wholly empirical manner, and to-day, as the old remedies are used, they are still employed empirically. In fact, until chemistry became a science and the composition and, more recently, the constitution of the substances contained in, or obtained from, the materials used had been demonstrated, it was impossible to gain any rational idea as to their behavior and particularly as to the changes which they undergo in the body.

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*Read April 21, 1906, before The George Washington University Medical Society.

Although for two centuries many inorganic substances and some organic substances have been prepared in the laboratory and factory in a fairly pure and definite condition and much has been known about them, yet it is only in the last half century that we have begun to acquire a definite knowledge of the constitution of chemical substances and to recognize that their properties are dependent now only on the matter of which they are composed, but also upon the manner in which that matter is arranged, or, to formulate this on the atomic theory, that substances differ because of the kind, or the number, or the relative arrangement of the atoms of which their molecules are composed, and, following out this last statement, we find that as the molecular atomicity increases the number of different substances having distinctly different properties which may be produced from the same number of the same kind of atoms is enormous.

This information has been gained not alone by the analysis of these substances, but by their synthesis also, and further by a close study of their behavior on analysis and synthesis and when acted upon by well-chosen reagents. Through these means it has been found that, as a rule, the arrangement in any given case is definite and that, moreover, portions of these organized substances tend to act as a unit and to enter into and issue from chemical reactions as elementary atoms do and to possess in themselves specific properties. These compound entities, known as radicals, are then to be counted with as the elements are and in any consideration of the physiological action of the substances of which they form a part they must be taken into consideration as entities.

The discovery of the fact that complex substances could be built up as well as torn apart and that through this means substances, and especially organic substances, occurring in nature could be produced in the laboratory has given an immense impetus to the pursuit of chemistry, and this has been further stimulated by the fact that it has been found possible to so control the union of these atoms and radicals as to form new compounds not heretofore found in nature, though many of them are built upon the same type as those which occur naturally.

As a result many organic substances like indigo, alizarine, methyl salicylate, vanillin and the like, which were formerly obtained solely from vegetable sources, are now wholly or largely produced artificially, while an enormous number of synthetic preparations, which is daily being added to, are offered for use in the arts and as remedial agents, and it is found that the substances thus made may be produced commercially in a purer condition and giving more definite and simpler reactions than those which are extracted from complex organisms such as occur in plants and animals.

In the production and laboratory study of these bodies an enormous amount of information has been obtained regarding the importance of arrangement, as in the case of hydrazobenzene, which is an indifferent body, and benzidine, with the same empirical formula, which is a diacid base; methyl cyanide with an agreeable odor resembling leeks and the methyl isocyanide with a perfectly unbearable odor; ethyl sulphocyanide with an ethereal odor and the ethyl isosulphocyanide with the penetrating properties which characterize the mustard oils; the *a*-naphthylamine, which melts at 50 degrees, possesses a pungent odor and gives an azure blue with ferric chloride, and the *b*-naphthylamine, which melts at 112 degrees, is odorless and is not colored by ferric chloride; the laevo-modification of lactic acid, which is consumed by the ***Pencillium glaucum*** and the dextro-lactic acid, which remains unattacked by this micro-organism. These are but a few of a multitude of examples which might be cited showing the effect of constitution on the properties of isomeric bodies. As examples of the effect of radicals we may cite the case of benzene sulphimide, familiarly known as saccharine, for if we introduce into the benzene nucleus of this substance two atoms of bromine in place of hydrogen we have a body which gives a sweet taste on the front of the tongue and a bitter taste on the base of the tongue; if instead of bromine we introduce two nitryl groups into the benzene nucleus we obtain a body which is intensely bitter, without any sweetness; if now instead of the nitryl groups we introduce two amido groups we obtain a body which is intensely sweet, sweeter even than saccharine. In fact, it is estimated that four pounds of this body will bring a ton of glucose up to the sweetness of cane sugar. Or we may point to mercaptan, which differs from common alcohol only in that an atom of sulphur is substituted for oxygen and which Richardson finds produces a narcotic effect, but acts upon the various nerve centers in the reverse order of other narcotics.

The examples of this kind which may be cited are very numerous, but I will not weary you by repeating more of them. What has been given suffices to illustrate my contention that the constitution as well as the composition of chemical substances materially affects their behavior and that this must be taken into account in determinating their value as remedial agents. Furthermore, this great variation in properties which the variation in composition and constitution enables us to obtain at will, ought to render it possible for us, by proper selection and use, to produce a desired effect or any desired degree of effect upon any organ, whether in a normal or in a pathological condition, but though the means be at command, we must acquire the knowledge of how those means are to be used before the desired result can be produced.

It is my opinion that chemical science has reached so advanced a stage that this knowledge may now be acquired by a systematic review of the literature, recording the data according to some well-devised plan, and by supplementing this with systematic experiments for the purpose of reconciling or explaining conflicting reports and for filling in the gaps which exist in the former experimental schemes. I believe that in Washington we are most happily situated for carrying out such a scheme, for, as you are better aware than I, there has been an immense amount of experimental work of this kind carried out in the past, though much of it has been of a desultory character, and the literature to be reviewed is vast in extent, but the existence here of the library of the Army Medical Museum gives unusual opportunities for gathering this material together and arranging it in that systematic manner through which only can it be rendered of service.

In advocating a systematic scheme of experimental inquiry into the physiological effects of chemically related substances, I am not advancing a new idea, for the problem has been attacked repeatedly. According to Professor Benj. Silliman, Jr., Dr. James Blake, late of San Francisco, was the pioneer in this line of research, his results being published in the *Archives Generales de Medicine* as early as 1839, and his researches were continued for half a century, but they were chiefly, if not wholly confined to inorganic compounds. In the early sixties Dr. Berry W. Richardson began a series of systematic researches upon organic compounds, his results being communicated in the form of Annual Reports to the British Association for the Advancement of Science beginning in 1864 and continuing for many years. Drs. Crum Brown and Thomas B. Fraser also published in the Transaction of the Royal Society of Edinburgh for 1868-69 the results of their researches on the connection between chemical constitution and physiological action, their work being principally upon those imperfectly known bodies, the alkaloids and their substitution derivatives; and later, Dr. Wolcott Gibbs, of Harvard University, and Dr. Robert Hare, of the University of Pennsylvania, published in the *Archiv für Anatomie und Physiologie* the results of their "Systematic research on the action of constitutionally related chemical substances on animal organs," the work being confined to the study of the phenols, the nitro bodies and organic nitrates. I do not assume in these few references to have given even an outline of the literature. I have but referred to the few examples which I have conveniently at hand. All know how actively this field of research has been cultivated in recent years, especially in Germany, and it is so important and so promising a field that its future cultivation is ensured.

I have cited these examples, first, to show that men of the first rank in the medical and chemical professions have regarded this work as of importance; second, to show that it is one which is now open freely to any investigator, and, third, to indicate that thus far each investigator has confined himself to some special feature of the subject. What I advocate is a systematic attack upon the whole field. Of course this will require a multitude of investigators to carry it through if it ever could be completed, but on the other hand a few could plan the scheme, devise the system of tabulation and notation, and then the results obtained by investigators everywhere would contribute to its development.

I trust that what I have set forth may have interested you sufficiently so that the influence of this society may be exerted toward bringing it to pass, for if it should prove that the George Washington University had undertaken the systematic investigation of this important subject and that it had enrolled graduate medical students who were engaged in such researches it would be an additional factor in fixing it among the leading universities of the world, and would contribute most valuable aid in the advancement of medical science.

THE PREVENTION OF TUBERCULOSIS.*

By W. P. Carr, M. D., Professor of Physiology and of Clinical Surgery.

The great prevalence of tuberculosis is so well known that little need be said on that subject. It is an established fact that one-seventh of all deaths are caused by it. All persons are exposed to the contagion and it would hardly be an overestimate to say that nine-tenths of all persons living in this country contract the disease at some time in one or more of its various forms. Indeed, if we consider slight involvement of glands, tubercular ulcers, and other minor manifestations, this estimate is too low. It would seem, therefore, a great boon to humanity if its ravages could be stopped or even checked in a marked degree. Certain facts, however, tend to show that the benefits to be derived from abolishing tuberculosis would be to a greater or less extent offset by evils. Considering the matter from a purely scientific standpoint we are forced to admit that at the present day the tubercle bacillus is the greatest factor in nature's great improvement scheme, "the survival of the fittest."

Tuberculosis is a disease from which the strong are immune or recover and from which the weak die. The great number of autopsies made in recent years has proved this fact beyond cavil. The frequency with which scars of healed tubercular lesions are found in autopsies upon those dead from other diseases has been noted by all pathologists. Dr. Shute and Dr. Phillips will tell you that nearly every cadaver used in the dissecting room of our school, no matter what the cause of death, shows some tubercular lesion or scar. Many of these lesions have been healed or arrested.

A vigorous man, even when he has contracted the disease in a severe form, will recover if given at all favorable conditions. The vigorous, however, do not contract the disease unless temporarily debilitated or unless exposed continuously to excessive numbers of the bacilli.

It is quite certain that the persons saved by eradicating the bacilli would be weaklings. Many of them would be saved for lives of suffering and for the propagation of still weaker offspring. The weaklings, particularly the poor ones, having to struggle for the bare necessities of a life devoid of recreation or pleasure, would gain little by being saved from a consumptive's grave. And the majority of the weaklings are poor, made weak by the conditions of poverty. Child labor, poor food, the cruelty or neglect of vicious or drunken parents, unhygienic habitations, long hours of labor in shops or factories, crowding, insufficient clothing, ignorance and many similar causes produce weaklings among the poor, while excesses and indulgences are the chief factors in their existence among the rich, where they are comparatively few in number.

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*Read March 17, 1906, before The George Washington University Medical Society.

In the fierce competition of the present day in all pursuits of life, even the strong have little leisure, and the life of a poverty-stricken shop-girl or factory-hand affords so little pleasure and so much suffering that it hardly seems worth saving unless we can at the same time make the individual so strong that work will not mean pain.

But we must remember that most of those we would save by abolishing the germ of tuberculosis would be saved for a more lingering and painful death by other diseases. The tubercular patient is notably cheerful and hopeful. It seems as if nature had created the tubercular bacillus as a sifter of her creatures, to sort out and destroy those whose low vitality would render life to them more painful than pleasureable and that she had armed this germ with a poison having decided analgesic and pleasureably intoxicating poperties. Without the tubercle bacillus these poor creatures would be condemned to a life of toil and dyspepsia, chronic catarrhs of the stomach and intestines, and a host of other painful and melancholic diseases that have no germ with analgesic properties.

I think that physicians in their desire to save life sometimes forget that death is not the worst evil that may befall a man. If we cannot put him in such health as to enjoy his life, as to derive from it at least a little more pleasure than pain, we confer a doubtful favor by saving him. And if we save a man from death by one disease for a more lingering death by a more painful disease we surely confer no boon. Is it worth while then to try to stop the ravages of consumption? Decidedly, yes! If we can do it in the right way. Decidedly, no! If we undertake it in the wrong way. The right way is nature's way. Strength means natural defense against the germ. Make the people strong enough to be immune. Abolish those things that produce weaklings and attack the germs only when they become aggregated in such numbers as to threaten even the strong.

But first let us take a look at the wrong way now advocated by many and threatening to be forced upon us by legislation, by the politicians, lay and medical. The attitude of these gentlemen, I may remark in parenthesis, is, to say the least, ungrateful; and the position in which they would place the medical profession certainly undignified. The politician in smooth and oily language of copious and subtle diction speaks in honeyed tones of the noble work of saving life, and asks the doctor's moral support and even his financial support. Translated into ordinary English his harangue is simply this: "Here, you medical men! You say you have found a way to check consumption. Now do it. Do it to the limit, or I will fine you. And, by the way, you must do it my way, not yours. Report all your cases to me that I may supervise you, or I will fine and imprison you. And, yes, you may contribute some of your wealth to support some of my charitable institutions. You don't have to do this, but I will see that you look mean and niggardly if you don't. I also ask you to endorse these measures fully and unconditionally." It would seem more modest in the politician if he should offer to assist the doctor by placing at his disposal facilities for carrying out necessary precautions in the care of poor patients. Especially when the doctor has established dispensaries everywhere for the treatment of the poor and does not need a spur to make him do his best all along this line.

The compulsory reporting of tubercular cases to municipal authorities looking to the enforcing of measures for stamping out the germ is now the vital issue. I think it can be clearly demonstrated that legislation in this connection would be, first, inefficient; secondly, that it would work great hardship to many poor patients; thirdly, that it would be a waste of money that could be otherwise used to good advantage, and, fourthly, that if it could be made effective it would deteriorate the whole human race, but this, fortunately, is impossible. The inefficiency of such legislation is demonstrated by the following facts:

(1.) The chief factor in the scheme is to be the sending to each patient printed rules to be followed so that he may not spread the germ. So far some thirty-one rules have been devised. These rules are so cumbersome and obnoxious that no patient is likely to follow them unless a special officer is detailed to watch him individually day and night. This would require two special officers for each patient. Even then we must remember that a diagnosis must be made before the case could even be reported and that there are thousands of cases not sick enough to call a physician, which are undiagnosed and which are each scattering millions of germs, enough to keep up an abundant supply even if all cases that came to physicians were quarantined. Even when a patient comes to a physician it is often a difficult matter to make a positive diagnosis, at least for a long time. And under such circumstances a physician would have to be very certain of his diagnosis or serious consequences might befall him. Besides, many domestic animals and, perhaps, birds contract tuberculosis and spread the germs. So that even if at great expense all diagnosed cases could be made to follow the rules, it would be like trying to sweep back the ocean tide with a broom. But it may be said that this is only theory and the the "Proof of the pudding is the eating thereof." Statistics in cities where the plan has been tried are said to show great reduction in the number of deaths and cases. New York statistics show a reduction of 40 per cent. I am surprised that no more is claimed on paper. Dr. Nicholas has investigated these statistics and finds that nearly all the so-called reduction was before the compulsory reporting began, and that in our own city there was a greater reduction during the same period without any legislation. The apparent reduction in the death rate from tuberculosis has been generally paralelled by a similar rise in the death rate of pneumonia, and no insignificant factor in this phenomenon has been the attitude of insurance companies in refusing payment in cases of death from consumption.

Hardship to the poor will surely follow such legislation or any widespread exploitation of tuberculosis as a contageous disease. Every narrow-chested individual will become an object of suspicion. Suspected employes will be discharged and be unable to obtain employment again, even though they have families to support. Again, the statistician says: "No, this will not occur. It has not occurred where the plan has been tried." I have only to say in reply that it has occurred, to my personal knowledge, in several instances in this city, following the comparatively slight agitation of the subject of tuberculosis that we have had. The government should be prepared to take care of such persons and families as they legislate out of employment. Even without assuming the care of such families and without making the scheme effective by employing two officers to watch each tubercular patient, a considerable amount of money would be needed to pay for printing and the salaries of officials. This money could be much more effectively used in many ways, such as the disinfection of badly infected houses, or the establishment of country homes for tubercular invalids. In view of the foregoing facts, it seems plain that the eradication of the bacillus of tuberculosis would work more evil than good and would result in a deterioration of the human race as a whole and would considerably increase the financial burdens of the government.

Fortunately, it is an utter impossiblity to eradicate the germs or to make any perceptible diminution in their number, except where they are unusually abundant in rooms or houses long occupied by consumptives in the later stages of the disease. Such rooms or houses should be reported to the health officials and be disinfected by them, for such concentrated accumulations of the germs are dangerous even to the strong. There are few physicians to-day who are not competent to treat tubercular cases and to use all available preventive measures. And the physician who has charge of a case has more interest in carrying out these measures and more influence with the patient in making him do his part than a strange official would have. Evidently little can be accomplished by direct warfare upon the tubercular germ, but tuberculosis can be eradicated and will some day be eradicated by fighting the disease in nature's way. Its eradication in this way will be followed by none of the evils above mentioned, because nature's way is to make the weakling strong so that he can laugh at the germ. This may seem quixotic, but is really more feasible than the method of attacking the direct germ and, vastly more economical in the end.

I can only hint at the steps by which this germ is to be eradicated. One of the most important things will be provision for the proper care, feeding and hygienic surroundings of poor children. We must begin with the children and make them healthy adults. The rich will need no attention, they will look out for themselves when the way is made plain. A way will be found to prevent the crowding of paupers in cities. They will be kept scattered in rural districts and the weaker ones provided with suitable out-door rural occupations. This may be done largely by allowing in cities nothing but light, roomy, hygienic buildings and by requiring landlords to refuse rental in cities to such paupers as would fall easy prey to the bacilli, and by offering them cheap sanitary dwellings in healthy suburbs. Transportation is becoming so cheap and rapid that many are even now finding it more pleasant and more economical to live in a healthy place outside of the city in which they work. All the numerous laws in relation to dairy and food inspection are in the right direction and are constantly tending to limit tuberculosis both in cutting out inspected food and by increasing health and resistance. Nearly all the necessary steps have been inaugurated already in some degree. It is only necessary to improve and perfect them to produce a wonderful improvement in the physical condition of the poverty-stricken classes, which are garden soil for tubercular germs. Physicians will take care of the well-to-do and carry out preventive as well as curative treatment. The great need is for money to take care of indigent children and for disinfecting dangerous dwellings. This may be furnished by charitable individuals or by the state. It seems to me a proper field for state aid and the important point upon which legislation is needed.

My main object, however, is to make plain the two plans of attacking the disease, and to demonstrate the fact that by abolishing the germ in the present condition of city life we should add enormously to the helpless invalid class and lower decidedly the physical standard of the race; that we should simply prolong and increase the suffering of many indigent persons. On the other hand, if we can first increase the resistance of these individuals nothing but good can result and a great diminution of the tubercular cases will follow. Of the two things, I think also, the latter is far more feasible and easy of accomplishment. By fighting the germ at present we are simply wasting time, energy and money that would be well expended in benefiting the condition of the poor. The time may come when by elevating the standard of resistance we have so far reduced the number of cases that a direct attack upon the germ may be profitable and lose its objectionable features. I hope that time will come; I believe it will come. But it is not yet.

A CASE OF LONG STANDING (NINE YEARS), FULL-TERM ECTOPIC PREGNANCY.*

By J. Wesley Bovée, M. D., Professor of Gynecology.

Ectopic pregnancy is by no means rare. About 5 per cent of the gynecologist's abdominal sections are made for this condition. About four per cent. of the sections for ectopic pregnancy are made for full-term cases. This is the oldest case of my experience.

The history is as follows:

Mrs. J., white, 30 years of age, was admitted to Columbia Hospital, in March, 1898. During her childhood she did not enjoy good health. Menstruation began at fourteen years of age, was irregular for the next few years, menstruating but two or three times annually, later became quite regular for a few months and then for a number of months at a time would be conspicuous for its absence.

This irregular interruption of the flow for months has continued to the present. Living in a malarial region, she has suffered more or less from malarial poisoning all her life, and this, with measles and other slight diseases, has kept her in bed a great deal. All during her premarital menstruating life she was very much annoyed with leucorrhoea. She was married at eighteen, and three or four months later had an abortion, which was attributed by her physician to heavy lifting. Her health continued about the same, and twelve months later she was delivered of a female child after a short and easy labor. No physician was present. Previous to its birth her face, eyes, feet and genitals were swollen. There was nothing of note in her condition until about December, 1888, when she began to have severe pains in the left inguinal region and left hip. A "knot" appeared in this region and gradually increased in size; a little later foetal movements were felt, and she expected to be confined in August, 1889. August 1, her physician wrote, "she was in labor, after having all the symptoms of pregnancy, and when I saw her, August 15, 1889, a diagnosis of extra-uterine pregnancy was made and the patient advised to call a surgeon." The pains continued about three months, after which period they gradually became less, but occurring with relapses sufficient to keep her in bed. Three years ago, she gave birth to a live child, and during this pregnancy seemed to suffer no more than previously, and the labor was short and much easier than the first, eight years before. During the following year, the patient enjoyed better health than before, but at the end of that time had another relapse and "was just able to drag around." Her weakness increased, and two months ago she was obliged to remain in bed and was bed-ridden when admitted to the hospital. Two weeks ago, she experienced great pain in the rectum and her physician removed therefrom the left parietal bone of a foetus, which she brought to the hospital. She has been obliged to take quite large doses of morphia at regular intervals during the past few months, and is clearly a victim of it. She is greatly emaciated, suffers constant pain, and is extremely sensitive to pressure in the left iliac region.

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*Read November 18, 1905, before The George Washington University Medical Society.

An examination reveals the presence of a tumor in the left side of the abdomen, extending from the vagina to the spleen, and firmly fixed. A finger in the vagina elicits a sense of crepitation in the mass so easily felt in the left broad ligament, slightly in front, which is thought to be a foetal skull.

On March 10, an operation was performed. The vaginal route for removal was rejected, unless an abdominal exploration determined it to be the preferable one. When the abdomen was opened the dense mass was found to be lying behind the peritoneum, and an attempt to reach it by an incision through the extra-peritoneal structures in the flank was made and abandoned, as too much dissection seemed necessary and the liability to open the peritoneal cavity too great. An attempt to stitch the peritoneum covering the sac to the edges of the abdominal incision was met with failure, and we decided to pack gauze about the abdominal incision and all about the point in the sac wall elected for its opening. The sac was then incised, and from it, after long, tedious efforts, the skeleton of a foetus, one or two bones at a time, was detached and removed with considerable quantity of faecal matter. No other parts of a foetus was found and no evidence whatever of a placenta was detected. The head was found near the spleen, and the relation of the bones with the wall of the sac rendered great care necessary to prevent puncturing the peritoneum. The skin and peritoneum of the edges of the abdominal incision were united with running catgut suture, and the edges of the sac wall were, in turn, stitched to the edges of the abdominal opening. It was now irrigated and packed with iodoform gauze around a rubber drainage tube. Two quarts of physiological salt solution was run into the abdominal cavity to be absorbed. The opening (or openings) between sac and bowel was not found or searched for, and, as expected, the bowel movements came through the opening of the sac for nearly two weeks, after which time it began to come through the anus and the fistula to close. "Scarcely any fecal matter comes through the opening, but quite a little pus" is noted on her history chart for April

1. April 10, is gaining rapidly, taking on flesh and color, and walks about the ward free of pain, although she has had no form of opium since the operation. She left the hospital for her home in May in better health than during the previous eight or nine years.

This woman suffers from a ventral hernia at the site of the drainage but dreads another operation and probably will never have it performed.

In presenting this specimen and its case history a few words concerning such conditions may not be amiss. Albucasis, an Arabian physician, living in Spain, is said to have been the first to clearly report a case of octopic gestation. About the middle of the eleventh century he saw parts of a foetus escaping by the process of suppuration, through the abdominal wall of a woman. During the sixteenth century Platerus, Horstius, Polinus, and Primerose reported fairly well authenticated cases. Those of Nufer and Christopher Bain, both classical, occurred about this time. It is probable that Nufer was the first to make an abdominal section for this condition though his operation is put down in literature as the classical first Cæsarian section on a living woman. The report of it appears in the collection of Casper Bauhin, and is recorded in Von Siebold's History of Obstetrics (Versuch einer Gesch. de Geb. Berlin, 1845, II, 95.) as follows:

"According to the relation of Casper Bauhin, in his appendix to the Latin translation of Fr. Rousset's writings upon Cæsarian section, Jacob Nufer, a swine-spayer, at Sigerhausen, in Switzerland, in the year 1500, delivered his own wife by opening the abdomen, and the operation proved successful for both mother and child. The woman was pregnant for the first time, and when labor came on and she had already suffered severely for several days, there had gradually assembled at her bedside thirteen midwives and several lithotomists. But all of them together were unable to relieve the poor woman of her child or to mitigate her suffering. Thereupon, the husband of the woman proposed to resort to the last means of saving her, and assured her that if she would take his advice he hoped, by the blessing of God, to bring the case to a successful issue. She gave her full consent, and Nufer persisted further in having the permission of the magistrate to his attempt. This, after some reluctance, was eventually obtained. Nufer next asked those of the midwives who had sufficient nerve for it to assist him in the delivery of his wife, while the more timid ones were requested to leave the room. Eleven of them chose the latter course, while two of them and all of the lithotomists remained to assist. The husband first besought the help of the Almighty, then closed the door, laid his wife upon a table and made an incision in her abdomen in the same way he was accustomed with the swine. He opened the abdomen so cleverly at the first incision that the child was safely extracted. When the eleven midwives outside the door heard the baby cry they desired admission, but this was refused until the baby was washed and the wound closed as in the swine. It healed rapidly. She was later confined four times and bore twins. The child delivered by the operation lived seventy-seven years."

Forty years later, according to Donatus, Bain's abdominal operation was deliberately done for the removal of a long-retained foetus. It is described as follows:

"In April, 1540, at Castrum Pomponii, commonly called Pomponischi, in the Province of the Lords of Gonzaga, not far from the river Po, there lived a woman whose name was Lodovica; but from her great size termed La Cavalla. She had been pregnant and the foetus had died in the uterus, while the soft parts had sloughed through the vulva and the bony portions had been retained within her. She recovered and again became pregnant, followed by a rapid loss of flesh, and was reduced to a condition of great danger. Christopher Bain, a traveling surgeon, happened by and offered to attempt to restore her for ten golden pieces if successful, and her body if she died. She and her relatives were very poor, and most of the money was raised by their good neighbors. The woman was tied up; he slowly cut through the abdominal wall, including the peritoneum, and at last opened the uterus and extracted the skeleton of a male child; he washed out the uterus with some warm wine and aromatics, and after cauterizing the edges of the wound, closed it with a suture. She recovered and in a short time had other children born in good condition. Later she had four in all. Witnesses: Dominus John Baptist Zorzonus, and Alexander Begher, Dominus Frederick de Filini, and Dominus Leonellus Zorzonus, and Antonius Maiochus or Mazzuchinus, and several others, present at the whole operation."

This operation was probably for an ectopic gestation, and was done fifty-four years before that of Primerose. About this time Platerus did his operation successfully (1594). In 1604, according to Webster, the first case of tubal pregnancy was reported by Riolanus, the younger, and the same author regards the first case of ovarian pregnancy reported to be that of Mercurus, in 1614. But of abdominal pregnancy the first good account is by Josephi, in 1784, and the first clear description of interstitial pregnancy was by Dionis, in 1718. To Madame Lefort belongs the credit of having first reported clearly, in the eighteenth century, a case of developed ovum between the layers of the broad ligament, a condition that in 1836 was called by Dezeimeris "Subperitoneo pelvic" pregnancy. Lawson Tait's investigations led to the determination that practically all cases of extra-uterine pregnancy are originally tubal, becoming other varieties, often, by escaping from the tube. His views on this subject are generally accepted by the profession.

It is interesting to note that most early writers considered the foetus had escaped from the uterus, and gave histories of injuries at some date during the pregnancy that had caused much extrusion. Altogether, the study of these early cases is very enchanting.

The longest period we found mentioned during which a foetus had been retained in the abdomen of its mother was fifty-seven years (Nebel). Sappey reported one of fifty-six years, and we found nine others of more than fifty years; six between forty and fifty years; ten between thirty and forty years; and forty-three between eight and thirty years, beside a considerable number in which autopsies on aged women revealed the presence of dead foetuses in various stages of decomposition, and without histories of such pregnancies.

The condition of the foetus in ancient ectopic pregnancy is variable, being apparently but slightly dependent on the time it has existed. Bayle removed postmortem from a woman's belly a foetus in good state of preservation that had been there twenty-six years, and Watkins one forty-four years old that was loose in the abdomen and perfectly well developed and preserved. Per contra, many cases are found in which trouble is caused by putrefaction, septic infection, sloughing into hollow viscera, or other depressing condition, within a very short time after the death of the foetus.

It would seem that the duration of retention of an extra-uterine foetus of advanced development depends largely upon whether the conception product becomes infected. The limit of time during which these foetal cysts may remain in the abdomen unmolested has not been determined, inasmuch as in a number of the very oldest cases death was due to some entirely irrelevant cause. In about 76 per cent. of the cases (Charpentier) infection occurs, and nature attempts to eliminate the foreign material and is oft-times successful, although in a large majority of them, if unaided by surgery, the women die of exhaustion as a result of pain, long profuse discharge, or sepsis. In the remainder, about 20 per cent., the foetus remains either in a fair state of preservation or changed by fatty degeneration, absorption of soft parts, calcification of the sac wall, or other metamorphosis. A true lithopaedion of the foetus does not form. Elimination, when attempted, is in about half the cases into some portion of the bowel, nearly as often through the abdominal wall at some point, far less frequently through bladder or vagina, and in one case through the perineum.

Location of Foetus.—Various authorities have insisted that nearly all cases of full-term ectopic gestation are intra-peritoneal. This is not readily reconciled with the preponderance of evidence going to prove that absorption of a young ovum placed in the peritoneal cavity progresses rapidly. Taylor and Webster agree that abdominal or intra-peritoneal gestation is uniformly fatal (unless removed by abdominal section), primarily by hemorrhage, secondarily by suppuration of the sac and peritonitis. Of course, the amount of hemorrhage may be so slight as to cause no alarm, and is usually least when rupture is near the fimbriae. Again, the foetus may escape in its unruptured membranes into the peritoneal cavity, the placenta preserving its attachment to the inner surface of the tube. Webster, Taylor and others have recently published views directly antagnotistic to this belief, and the author believes that while it is possible to retain a foetus sufficiently long in the Fallopian tube for its arrival at such a stage of development that when suddenly expelled into the peritoneal cavity it will resist absorption, and that intra-peritoneal pregnancy may occur without passing through the broad ligament, but that practically all full-term ectopic gestations are, or have been, broad ligament pregnancies. Either the pregnancy develops and remains extra-peritoneal, bulging either the anterior or the posterior fold of the broad ligament, or has finally ruptured through the peritoneum into its cavity. The case herein reported, and one we previously recorded, were unquestionably extra-peritoneal. Dunning's interesting case was of this variety, and many of those reported during the past few centuries were clearly proven to be of this type. It is probably those old cases that opened into the bladder, vagina, or peritoneum, or into the bowel, as did the one herein detailed, are of this variety, and even some of those opening through the lower part of the abdominal wall may have dissected up the anterior layer of the peritoneum, and here escaped without even having invaded the peritoneal cavity.

Pregnancy and Labor During Ectopic Pregnancy.—Another interesting feature of the case herein reported is that while in possession of the old ectopic gestation the woman again became pregnant, and was delivered of a living child after a very easy labor. This interesting condition has occurred in at least quite a large percentage of cases we have studied, and even in a few instances two different estopic pregnancies have been found at the operation or autopsy. These were usually of different stages of development, being either of the same date, and one becoming blighted first, or altogether different as to age.

Treatment.—Parry and others of the early writers on the subject of full-term ectopic pregnancy have been opposed to surgical assistance except when the life of the woman was clearly in immediate danger. But that was before surgical invasion of the peritoneal cavity was so safe as it is now, and the views expressed have been gradually tending toward surgical relief as the routine treatment for this condition. The principal cause of death in abnormal section for these advanced cases is sepsis. It would seem that if the large majority are extra-peritoneal, many of them would not require celiotomy. However, if a transperitoneal operation be necessary, then treatment of the sac by stitching it to the abdominal wall before opening it, or when not possible, afterward, would be the most approved plan of procedure when the sac cannot be enucleated.

When much denudation of tissue in the pelvis results from cystectomy, then drainage through the vaginal roof will be advisable. Although the operation may be done thoroughly aseptic, if, in these greatly weakened women, a space is left in which accumulation of fluids may exude, we must expect its infection before absorption of it occurs, and a considerable loss of life to result.

A MORE LIBERAL DIET IN TYPHOID FEVER.*

By Thomas A. Claytor, M. D., Professor of Therapeutics and Clinical Medicine.

This subject has been approached with some hesitancy for two main reasons: First, the profession, as a whole, is strongly opposed to more liberal feeding in enteric fever, and one who advocates it runs the risk of sacrificing, to some extent at least, the confidence which may have been reposed in him by his brother physicians; second, an argument in favor of a more liberal diet might be misconstrued into one for too full a diet, and thus do harm.

I wish to present to you the results in a small number of cases, twenty-six in all, which I have treated on a more extended dietary during the past year. The results have been no better, as far as ultimate recovery goes, than in cases treated with a more restricted diet, but my patients have been far more comfortable, happier, and have, I think, convalesced more promptly.

The treatment, dietary and otherwise, of all diseases has changed from time to time, but it must be acknowledged that typhoid fever, from the days long before it was separated from other continued fevers (1813-1837) to the present time, has been rather a notable exception. Following the precepts of Hippocrates, Galen, Celsus, and a long line of distinguished physicians urged a very rigid diet during the acute stage of fevers, consisting chiefly of barley water and the like. In the latter half of the seventeenth century the teachings of Thomas Sydenham, who followed a vigorous antiphlogistic plan, had a strong influence on the feeding in continued fevers. Water-gruel and barley-gruel represented his dietary with the addition of a few spoonsfuls of broth several times a day. During the eighteenth century and the early part of the nineteenth, the diet became more liberal but was exclusively vegetable. Farinaceous gruels, fruit juices, and soft fruits were allowed. Very restricted diet prevailed, however, until the time of Graves of Dublin, whose influence was felt in the latter part of the first half of the nineteenth century. He was considered to have very liberal ideas as to feeding in fevers. He recommended well-boiled gruel with sugar and lemon juice or panada, of which a spoonful was given every third hour. In France, Brossais, arguing from the basis that all febrile conditions depended upon gastrointestinal irritation, urged a most rigid diet in fevers. The doctrines of Brossais were attacked by Trousseau, Herard, Monneret and others, and were finally overthrown in 1857.

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*Read November 18, 1905, before The George Washington University Medical Society.

Milk did not come into favor until the last third of the past century, but since that time it has been almost the sole dependence in typhoid fever.

It would appear from the foregoing that there has been a gradual, very gradual, tendency to increase the amount of food given in continued fevers ever since the time of Sydenham, and I should not be surprised, if in less than fifty years, those looking back over our exclusively milk diet will feel much the same sympathy for our patients as we feel for those poor fellows of not so long ago who, though parched with thirst, were allowed little or no water. The argument advanced by the advocates of the milk diet is, that, on account of the inflamed and usually ulcerated condition of the small intestine in typhoid fever, liquid food should be given. They seem to forget that milk ceases to be a fluid the moment it reaches the stomach, and that all food which is properly prepared and digested reaches the ileum, the most common seat of greatest inflammation, in a more or less fluid form. In view of the latter fact it would seem that the food in typhoid fever only needs to be finely divided and digestible, and to be accompanied by a sufficient amount of water. E. K. Herring puts it rather aptly when he says, "It should be free from strings and stones and skins and bones."

It has been proved experimentally that the digestive and absorptive powers, during typhoid fever, fall off for only five to ten per cent, so that impaired digestion is not sufficient argument in favor of milk alone.

It has long been recognized that typhoid fever is a general infection, the bacilli having been found in practically all the tissues of the body; the intestinal lesions, therefore, are by no means the whole matter for consideration.

Curschmann's analysis of the causes of death in 580 cases of typhoid fever (Nothnagel: "Encyclopedia of Practical Medicine") shows: Severity of infection, 46.9 per cent; intestinal perforation, peritonitis, 16.5 per cent; hemorrhage, 7.8 per cent. Thus it may be seen that only a little less than half died from the severity of the infection, whereas a little less than one-fourth died from intestinal lesions. Taking these as representative figures, it is quite clear that we have twice as much to fear from the inability of the patient to withstand the severity of the infection, as we have from the intestinal lesions. It would seem equally clear, then, that the first indication is to maintain the bodily vigor at the highest point possible. It has also been suggested by Barrs (*British Medical Journal*, 1897) that starvation would tend to prevent the healing of ulcers in the intestine, in the same way as in similar conditions in other parts of the body. It also seems likely that if the patient were allowed a greater variety of food during the febrile stage, there would be much less likelihood of bad results from indiscretions during early convalescence.

For several years I have been inclined to break through the ironclad rule of almost an exclusively milk diet; so very cautiously and with many fears and misgivings have I done so. So great has been the prejudice in favor of an absolutely liquid diet, as represented by milk with the occasional substitution of animal broth or tea, that the physician is almost afraid to take the risk of suggesting any change, knowing full well that, should anything go wrong he would be held responsible, if not by the patient and his friends, certainly by the profession, because of reckless feeding.

Since typhoid fever cannot be aborted, nor influenced by any form of specific medication, our efforts are directed toward so ordering the general conduct of the case as to avoid complications and to hasten recovery.

The trend of thought of the present day is toward the belief that most diseases are due to specific poisons, and that recovery depends upon, either the exhaustion of that poison, or the development of an antibody of some sort, which renders it innocuous.

It becomes necessary, then, to keep the patient in the best possible condition to withstand the ravages of the disease until such time as recovery shall take place.

Since many are exposed to typhoidal infection who do not develop the disease it is very evident that some have greater resisting powers than others, and it is probably due to this fact that we have not all had the fever. It seems reasonable to suppose that a long attack is due, in part at least, to the inability of the individual to overcome the poison. Therefore, we should do all we can to develop the resistive power, or in other words, to keep up the strength of the patient. To accomplish this end we must give sufficient food. Now it is almost impossible to give milk alone in sufficient quantity to supply the needs of a man through a long illness, even though it comes nearer to being a perfect food than any other article.

Voit's table shows that the normal man of an average weight of seventy-five kilos (150 to 165 pounds) doing a moderate amount of work requires a total food value of 3,000 calories per day to maintain the body in good physical condition. It has also been estimated that the body at rest requires 2,300 calories. Now the man suffering from typhoid fever would certainly require a larger food value than the man at rest because of the greater energy evolved in fever, if from no other cause. This excess would be hard to estimate accurately, but it has been placed at 500 calories, which would bring the total food value requirement up to 2,800 calories, for a patient suffering from typhoid fever.

Now if 180 c.c. (six ounces) of milk, representing 200 calories, be given every two hours day and night, the total food value would, in twelve feedings be 2,400 calories; but few patients are wakened every two hours for food, so that nine feedings, at most, would be given, representing but 1,800 calories. Thus it is readily seen that the usual exclusive milk diet falls short by 1,000 calories, more than one-third of the supposed requirements.

Chittenden's experimental work in physiological economy has apparently proved that, so far as those in health are concerned, a food value of 2,000 to 2,500 calories, representing about half the nitrogenous food previously supposed to be necessary, is quite sufficient to maintain a perfect bodily and mental equilibrium. Of course this new scale rather throws doubt on all former calculations as to the bodily requirements in health and to some extent also in disease. But aside from all economic calculations it is well known that an exclusively milk diet, six ounces every two hours, does not satisfy the craving for food. We also have the most practical evidence of insufficient nourishment in those suffering from typhoid fever in their enormous loss in weight. Of course we recognize the fact that no matter how carefully we feed these patients there will surely be a loss in bodily weight, but it need not be so great.

In selecting a diet for typhoid fever patients the following important points should be borne in mind: It must be highly nutritious; it must be easily digested; it must be innocuous; it should be palatable. The food must possess sufficient nutritive value to maintain, as far as possible, the bodily equilibrium. Since the digestive functions are likely to be somewhat impaired, the food must be of such a kind and so prepared as to throw as little extra work upon them as possible. The food must be innocuous. Neither by its coarseness, bulky residue, gas-producing or other properties, should it tend to cause the serious complications of hemorrhage and perforation. Outside of the comfort and pleasure which palatable food affords the sick man, Pawlow has shown that it has an important bearing on its digestibility.

It has been my custom of late to begin the treatment of a case of typhoid fever, no matter on what day of the disease it may come under my care, with the regulation six ounces of milk every two hours, night and day while awake. Animal broths are given in place of milk, to vary the monotony for those who can take milk, and as a substitute for those who cannot. Each day, after the subsidence of the more acute symptoms, such as headache, I ask the patient if he is hungry, and as soon as he replies in the affirmative a soft-boiled or poached egg is allowed, and if well borne, the number is gradually increased to three or more a day. The next additions are jelly or blancmange, custard, soft toast, the carefully selected soft part of baked apple, or rice which has been boiled four hours. The last to be tried are scraped beef or chop, very finely divided chicken and baked potato, the latter only when digestion seems specially good.

I do not want to be understood as advocating so full a diet in every case, but each case should be studied individually, and when, from the condition a more liberal amount seems advisable, it should be given.

I cannot but believe that most of the foods mentioned are quite as digestible, far more palatable, and less likely, if anything, to cause perforation or hemorrhage by their local action or gas production than milk. It is well known that milk often produces tympanites, that it leaves a large residue after digestion, and is more likely to cause impaction than almost any other food. Often in typhoid fever large curds are detected in the evacuations. It is then customary to reduce the already insufficient supply of milk by further dilution. Why not try something else?

Before analyzing my tabulated list I would like to call attention to one case whose unusual severity has materially raised the averages. This woman had fever for 97 days, was in bed 127 days, and in the hospital 135 days. Of course such a lengthy illness is uncommon, but it must be included.

In the deduction of averages I have disregarded small fractions as immaterial.

I wish to thank Dr. Homer Fuller, late resident at the Garfield Hospital, for having taken from my histories the data in this table.

Case No.	Day of Disease on Admission.	Day of Disease, Temperature Normal.	Day of Disease, Out of Bed.	Total Hospital Days.	Relapse.	Hemorrhage.	Delirium.	Highest Temperature.	Widal Reaction.	Complications.	Result.
No. 1...........	15	63	67	71	No	Yes	Yes	104.6	Pos.	Hem.	R.
No. 2...........	9	44	54	55	"	No	"	104.6	"	Delir.	R.
No. 3...........	3	31	40	50	"	"	No	104.8	"	No	R.
No. 4...........	2	32	40	49	"	"	"	103.8	"	"	R.
No. 5...........	5	45	61	63	"	Yes	"	105.6	"	Hem.	R.
No. 6.....	4	41	55	56	"	"	Yes	105	......	"	R.
No. 7...........	6	31	42	46	"	No	No	103.6	......	Pleur.	R.
No. 8..........	6	97	127	135	Yes	Yes	Yes	105	Pos.	Hem.	R.
No. 9...........	4	20	39	46	No	No	No	104	"	No	R.
No. 10...........	7	61	55	82	Yes	"	"	105.6	"	"	R.
No. 11...........	6	44	54	53	No	"	"	105.6	"	Pleur.	R.
No. 12...........	15	36	50	35	"	"	"	105	"	No	R.
No. 13...........	6	57	58	63	"	"	"	104.2	"	Osteom.	R.
No. 14...........	7	20	40	41	"	"	"	102.8	"	No	R.
No. 15...........	10	29	39	32	"	"	"	104.4	"	"	R.
No. 16...........	5	24	38	41	"	"	"	104.2	......	"	R.
No. 17...........	9	47	61	56	"	Yes	"	104.8	Pos.	Hem.	R.
No. 18...........	15	43	39	30	"	No	"	102.8	"	No	R.
No. 19...........	5	9	22	20	"	"	"	102.6	"	"	R.
No. 20...........	22	53	73	59	"	"	Yes	106	"	Delir.	R.
No. 21...........	6	11	22	18	"	"	No	104.2	"	No	R.
No. 22...........	8	16	30	27	"	"	"	103.4	"	"	R.
No. 23...........	3	24	39	48	"	"	"	104.4	Part	"	R.
No. 24...........	3	44	53	85	"	"	"	105.2	Pos.	"	R.
No. 25...........	3	38	48	45	"	"	"	104	"	Phleb.	R.
No. 26...........	1	51	61	31	"	"	"	104.2	"	No	R.
Average........	7	39	50	50	2	5	5				

Of these 26 cases all recovered. The shortest duration was 9 days, the longest 97, the average 39; the earliest day on which a patient was out of bed was the 22d, the latest, the 127th, the average the 59th. The shortest stay in the hospital was 18 days, the longest 135, the average 50.7. (The last figures, relating to the number of days in the hospital, are of no value, as the date of admission was in some cases very late, while others left before they were completely recovered.) There were two relapses; in five cases one or more hemorrhages occurred, but in only one instance, as it happened, had an exclusively liquid diet been exceeded before the occurrence of hemorrhage. Delirium was present in five cases. Other complications were not more numerous than usual except pleurisy, which was twice recorded.

While I know that twenty-six cases form far too small a number from which to draw conclusions of any great value, yet it is my belief that the careful personal observation of even a few cases should be recorded, for it will require the weight of evidence of many clinicians to shake the implicit faith of the profession in the exclusive milk diet.

From my own-experience I am prepared to say that the more liberal diet is certainly not deadly; if it possesses no special advantages neither does it show special disadvantages. The advocates of the more liberal diet, among whom I take my stand, claim that the patient is more comfortable; that the attack is slightly shortened; that convalescence is more prompt, and that neither relapse, hemorrhage, nor perforation is more frequent.

The advantage which is most apparent is the increased comfort of the patient. Typhoid fever is at best long and tedious, and we are all familiar with the days and weeks during which our patients clamor for more to eat. The pangs of hunger are much harder than many other discomforts that they are called upon to bear after the first ten days of fever. Now if more liberal feeding does no harm this one advantage—the comfort of the sick man—is sufficient argument in favor of its adoption, but more is claimed.

F. C. Shattuck (*Boston Medical and Surgical Journal*, Vol. 148, 1903) reports a mortality of 10 per cent. in 233 cases on an exclusively milk diet, while the mortality was but 8.45 per cent. on an enlarged diet. Fitz's analysis of the cases of typhoid fever in the Massachusetts General Hospital (*Boston Medical and Surgical Journal*, 1899) shows that the mortality was less in Shattuck's cases, on a more liberal diet, than in those of his colleagues, on a milk diet; and that relapses were 2.9 per cent. less frequent in the liberally fed. W. H. Smith has brought these statistics up to 1902, and shows that in 563 cases, hemorrhage, perforation, and relapse were no more frequent among the more liberally fed.

Shattuck's diet list is about as follows: Minced lean meats, scraped beef, soft part of raw oysters. Soft crackers with milk or broth, soft puddings without raisins, soft toast without crust, blancmange, wine jelly, apple sauce, and macaroni.

Of course the way to become convinced is to try the system, but those who are interested will find instructive articles, besides those already mentioned, by Marsden (*The Lancet*, January, 1900), the late F. A. Packard (*Therapeutic Gazette*, 1900), Murrell (*Medical Brief*, St. Louis, 1900), Morris Manges (*Medical Record*, 1900), and H. A. Hare (*Therapeutic Gazette*, 1904). The latter states that his attention was first called to this matter by an attack of typhoid fever, during which, though he had no appetite, yet he felt underfed. He felt that he was attacked on the one hand by the bacillus of Eberth and on the other that his powers of vital resistance were being reduced by partial starvation. Two of the most thoughtful articles on the subject are by J. B. Nichols (*American Medicine*, Vol. 9, No. 18, and *Medical Record*, 1905). Thayer's translation of Bushuyev's article has attracted wide attention, and although the latter's results were excellent, I am not yet, nor do I ever expect to be ready to advise such a diet for typhoid fever patients as he advocates. It is rather too much on the order of that for a day laborer.

It is far from my intention to speak ill of the bridge which has carried so many safely over, and indeed, from long experience, I have a most wholesome respect for the milk diet in typhoid fever, but I do believe that the pendulum is making a belated swing toward more liberal ideas with regard to feeding.

CIRRHOSIS OF THE LIVER WITH REPORT OF A CASE.

By Thomas S. D. Grasty, M. D., Assistant Professor of Bacteriology and Pathology.

Since 1514, when Versalius, followed by Harvey and Morgagni, first described the hardened condition of the liver, now known as cirrhosis—a term given by Laennec in 1819, who regarded the bile-stained hob-nails as masses of yellow new growth invading the liver, but now known to be islands of liver cells encircled and compressed by surrounding bands of contracting fibrous tissue—many and diversified attacks have been made upon this type of disease and its relation to the human organism. The subject of hepatic cirrhosis is, indeed, vast and is one on which a great deal has been written. Extensive experimental work performed in recent years has changed many of our views both regarding the prognosis and treatment of this disease.

Portal cirrhosis, a disease of late middle life, and usually proves fatal at about fifty years of age, is more common in men than women in about the proportion of five to two.

Experiment has shown that a large number of poisons are capable of giving rise to changes in the liver comparable to those of cirrhosis (often it is true, the lesions are early or at the best not well marked). But the facts are of value as indicating that cirrhosis in man may reasonably be considered as the result of a toxic process. The poisons may be absorbed from the alimentary canal and reach the liver in a comparatively concentrated form or they may travel to the liver by the hepatic artery, in this later event the dose being comparatively dilute as compared with the former. Ordinary cirrhosis in man is generally due to poisons traveling by the portal vein.

Alcoholism is rather an antecedent condition than a "causa vera" and acts indirectly or in an accessory manner, though in ordinary practice the association between cirrhosis and antecedent alcoholism is of fundamental importance; although it is well known that among the Brahmins and other high-cast Hindus, who, as a rule, lead abstemious lives and never touch alcohol, cirrhosis of the liver is of frequent occurrence. The possibility of cirrhosis being definitely due to micro-organisms is one that must be faced; from analogy it is most probable, but at present, as in the case of syphilis it has not been certainly established. It is also highly probable that poisons, or perhaps micro-organisms, reaching the liver by the hepatic artery may give rise to changes of a cirrhosis nature.

As regards the nature of cirrhosis it is in the present state of our knowledge safest not to regard the cirrhotic process as exclusively due either to irritative hyperplasia of the connective tissues, the hepatic cells being quite passive on the one hand, or to primary degenerative or atrophic changes in the hepatic cells with a resulting replacement fibrosis on the other, but to remain content with the view that the irritative poisons leading to cirrhosis affect both elements in different ways and that the resulting change in one tissue may further initiate fresh changes in the other tissue or modify those already existing.

Many classifications have been introduced both clinically and histologically as portal, biliary, hypertrophic, multilobular, mono-lobular, pericellular mixed and sporadic each with many sub-divisions indicative of the most marked changes. These I shall not enter into. Suffice it to say that the size of the liver in ordinary cirrhosis may vary greatly from 30 to 150 to 200 ounces, and it is noteworthy that a cirrhotic liver, which is actually smaller than normal, often weighs as much as a healthy liver, or even more, its specific gravity being much increased. There are also many changes occurring in the gall-bladder, bile-ducts, portal vein, spleen esophagus, stomach, small intestine, pancreas, kidneys, with many associated lesions, it being an established fact that tuberculosis is met with in the bodies of patients with cirrhosis more often than in other non-tuberculous diseases, together with chronic peritonitis, arteriosclerosis, heart conditions, carcinoma, et cetera.

Some writers have spoken of hepatic cirrhosis as a disease which is not strictly limited to the liver but is a part of a general change and in this respect it might be compared to the condition of red granular kidneys, which is a local manifestation of a general vascular change, arteriosclerosis. Portal cirrhosis might in the same way be considered to be a part of a general change in the alimentary system, for the spleen, the intestines and the pancreas commonly show changes in hepatic cirrhosis. Some of the changes are secondary to portal obstruction, but this does not account for the visceral changes and some of them must be regarded as concomitant effects of a general cause, in many cases, alcoholism. As bearing on this conception of cirrhosis as a part of a widespread change in the alimentary system, Klippel and Lefac have pointed out that, in some instances of cirrhosis the changes may be more advanced in the pancreas than in the liver. The secondary relation of cirrhosis to a general cause is also seen in hemochromatosis, where, as a secondary result, cirrhosis of the liver and pancreatic fibrosis may occur.

The course of ordinary cirrhosis may be divided into:—First, the early pre-ascitic stage; second, the late or asitic stage.

The early stage begins vaguely and gradually; the symptoms are mainly those of dyspepsia, often of an alcoholic nature, with loss of appetite and gastro-intestinal disturbances. Epitaxis may occur now and then, but the most important event in the early stage is the occurrence of hematemesis. The liver is generally somewhat enlarged and slightly tender, chiefly due to vascular engorgement.

In the late stage, usually some months or years may elapse before ascites develops. The disease may become latent from the development of compensatory processes. The development of ascites may come on suddenly and when occurring the patient has undergone considerable amount of wasting and shows marked muscular debility. The wasting of the temporal and facial muscles gives a characteristic appearance to the patient, the atrophy of the thoracic muscles shows up in marked contrast to the swollen abdomen, the skin becomes harsh, dry, loses its elasticity, petechiae may develop, while there may be hemorrhage from the various mucous membranes and oozing from the gums. This feature was present to a marked degree in the case which I shall present, his pillow being soiled with bloody mucoid discharge.

The ascites may require tapping once, twice or even oftener, but all authorities agree that in cases of cirrhosis uncomplicated by chronic peritonitis paracentesis is seldom required more than once. (In this respect I would say that the case that I shall report has given no indication of such a condition. Yet, paracentesis has seemed imperative twenty-one times.) The patient emaciates rapidly, loses strength, becomes stupid, drowsy, or even delirious. I should like to emphasize the nervous symptoms, as my patient exhibited them during the course of his disease to a marked extent. During two exacerbations the urine was much diminished, and with the development of slight fever the patient exhibited signs closely simulating cerebral uraemia, intense headache, amaurosis, noisy delirium with resulting stupor, following which for several weeks there remained slow cerebration with some loss of memory.

Portal cirrhosis commonly lasts a considerable time, one, two or more years, usually intervening before the appearance of symptoms due to the liver, if, indeed, their first appearance can be accurately described, and with the exception of Flint, all authorities agree that when acites has developed death usually follows before the patient requires tapping more than twice, unless complicated, as before stated, with some degree of chronic peritonites.

As regards the relief of portal cirrhosis, many remedies and methods have been devised, all having for their object the establishment of a collateral or compensatory circulation. I shall only call your attention to the more recent surgical treatment. The operation of paracentesis is a very simple one with the ordinary surgical technique now at our command and should, in my opinion, be used early, as it is productive of only good results when properly done.

With reference to the more recent surgical treatment, I refer to Talma's operation, or the treatment by the production of vascular peritoneal adhesions. This method, as devised by Drummond and Morrison, was based on the assumption that ascites was due to portal obstruction and was an attempt to increase the collateral circulation between the radicles of the portal vein and the general systemic circulation. The operation was original in Morrison's hands, but it appears that it had been previously planned by Talma and carried out by Vonder Menlen in 1889, Schelkley in 1891, and Leus in 1902. The operation consists, after paracentesis and with the usual technique, in making an incision parallel to the right costal margin, the peritoneum over the liver and diaphragm is scraped or curetted, so as to set up adhesive inflammation and the surfaces are brought together by stitching the round ligament to the abdominal parietes, or by passing stitches through the liver itself. Whether or not the improvement which sometimes results both in the general health and in the local condition simply depends on the collateral circulation relieving the pressure in the portal vein or not, has not been decided, though it appears to me that there are at least two other ways in which the establishment of a collateral circulation in the adhesions around the liver may be of benefit. First, by diminishing the flow of blood through the liver it may enable this organ to deal more satisfactorily with the blood passing through it and so reduce its toxaemic condition. Second, that the presence of vascular adhesions over the surface of the liver would relieve venous engorgement and so allow a freer supply of arterial blood.

As regards the ultimate results of this operation I can only present a few statistics: Kolmskie (1904) collected 168 cases; 46 per cent cured or improved, 49 per cent unimproved, 5 per cent unknown.

Burns (1902) collected cases during the preceding five years; 37 per cent. mortality, 10 per cent. cures, 20 per cent. markedly improved.

In 105 cases collected by Greenough only nine showed improvement after two years.

The history of the case which I wish to present is as follows and exhibits the following unusual features: (1) Long duration of the disease; (2) Number of times paracentesis was required: (3) Apparent recovery of general health with disappearance of ascites for over one year.

E. Y., age 48, American, male, residence Washington, D. C., clerk in Government office.

FAMILY HISTORY. Paternal.—Grandfather died suddenly at age of fifty-seven. Grandmother died suddenly of heart disease, age thirty-nine. Maternal—Grandfather dropped dead in January 1888, age seventy-seven. Grandmother died aged eighty, from general asthenia. Parents—Father died at thirty-one years of age from pneumonia. Mother living, has had some cardiac disturbance for years. One sister died of measles, age three years, one brother died when an infant; one sister living, some cardiac disease, very neurotic temperament; another sister living, suffering from neurasthenia.

PREVIOUS HISTORY.—Birth normal, breast fed, usual diseases of childhood, measles, typhoid fever, etc. Began school at six years, mental development normal. Health during youth and early life good, user of tea and coffee. tobacco not used in any form, alcohol used constantly during past fifteen years with numerous excesses, to great excess during one year. Alcohol not used in any form since July 1903. Denies any specific history.

HISTORY OF PRESENT ILLNESS.—First symptoms noted October, 1900, when he began to suffer with signs of a chronic gastric catarrh, anorexia, furred tongue, bowels irregular, constipation alternating with diarrhoea, together with some bleeding from gums. Was compelled to go to bed and was unable to perform his daily duties for about three months. Had some abdominal tenderness, distention, was treated by a physician with drugs and the local application of an ointment and condition improved so that he returned to work. Though advised strongly at that time to give up alcohol, patient returned immediately to its use. From February, 1901, to June, 1903, enjoyed fair health, with two attacks of vertigo, falling upon the street during periods of excessive drinking.

In June, 1903, I was called to see him and found his condition at that time as follows: Height, about 5 feet 8 inches. Weight, about 140 pounds. Dorsal decubitus, head raised rather high on pillows. Facial expression dull, intelligent. Body much emaciated, muscles wasted, especially those of face, temporals markedly so, muscles of throacic wall much atrophied, bones prominent, no deformities, ankles slightly swollen. Skin sallow, muddy, dirty in appearance, no discoloration of conjunctivae. Skin over face drawn and thin and shows several clusters of dilated vessels, or stigmata, one on forehead particularly prominent, some also present over lower limbs, stellate in appearance. Skin dry and harsh over rest of body, except over abdomen where veins are distended and skin drawn, shiny and tense. Hair scanty and dry, glands (superficial) not perceptibly enlarged. Has post nasal catarrh with much mucus dropping back into posterior pharynx, expectoration at times, blood tinged, no bronchial cough, lungs apparently normal, with exception of few moist rales over bases posteriorly, respirations increased, rather labored and panting. Heart rapid, no murmurs, pulse regular, though weak, apex beat slightly higher than normal. Lips dry, pale and fissured gums red and spongy, bleeding upon slightest pressure, tongue flabby, furred and dry, slightly tremulous. Throat shows evidence of chronic congestion, deglutition normal. Appetite very poor, thirst excessive, vomits at times, with much mucus. Intestinal digestion poor, bowels sluggish. Temperature 99.6 F. (mouth.)

The physical examination of the abdomen shows abdomen greatly enlarged, measuring 48 inches in circumference, enlargement uniform, umbilicus protruding, tense and shining. Movable dullness over flanks, resonance over umbilicus, distinct wave and thrill felt on palpitation. On deep respiration edge of liver felt distinctly from 2 to 2 1-2 to 3 inches below costal margin, spleen not palpable, veins in region of umbilicus distended. Nervous system negative with exception of some headache and extreme depression. Vision fair, wears glasses, conjunctivae very pale, vessels much distended and injected. Other special senses normal. Kidneys seem to be functionaling normally, urine high colored, contains slight trace of albumen, no casts. Genitals much atrophied.

PROGRESS OF CASE.—During first few days after my first visit the patient drank large quantities of alcohol, followed by acute delirium, fever, slight jaundice and a marked diminution in the amount of urine which became very dark and high colored. On July 6, '03, paracentesis was performed and about 3 1-2 to 4 gallons fluid removed. Since then to August, 1904, patient was confined to house and bed and was tapped twenty-one times. The intervals at first being from three to four weeks. When distention was marked there would occur some degree of stupor, marked edema of feet, legs and testicles, becoming so great on one occasion as to require multiple incisions in skin with pressure bandages, appearance of hemorrhoids; jaundice never a marked feature, though skin would become slightly icteroid, frequent hemorrhages from gums and throat, some petechial spots over body, with the development of a laryngeal cough, raising much mucus, often bloody in character. After several successive tappings it was found that the liver was decreasing in size, encroaching on the costal margin. During attack of fever mental condition would become very bad, some low muttering delirium with loss of memory, and a desire to repeat the same question, word, or phrase again and again.

During his illness he was seen by three other physicians with me in consultation, all of whom agreed with the diagnosis already made and gave a very unfavorable prognosis. One of them advised that if his general condition did not rapidly improve that a Talma-Morison operation should be done, this, however, was not agreed to by his family.

Since August, 1904, his condition has steadily improved, the ascites never recurring, emaciation, still marked, appetite good. He now spends much of his time in walking and being out of doors.

The ascitic fluid removed gave the following analysis:

(1.) Yellowish color.
(2.) Almost clear, at times slightly bile stained alkaline.
(3.) Specific gravity 1.015.
(4.) Much albumen.
(5.) When placed upon culture media no growth occurred.
(6.) Microscopic examination shows few mono-nuclear lymphocytes.

His physical examination at present shows the existence of no heart murmurs, liver cannot be felt, urine free from albumen and casts, abdomen slightly swollen, measuring now 34 inches. The right side of scrotum much larger than left, though testicles easily felt and is about same size as left.

As regards treatment, he has been given all treatment that I had at my command, purgatives, diuretics, diet, potassium, iodide, Neimeyer's pill, etc., the most satisfactory proving to be magnesium sulphate each morning before breakfast, given in as little water as possible.

Is the patient cured? It is difficult to say that any case is cured, but here is a man, on the point of death from a disease well known as commonly being deadly in its effects, who, after submitting to a certain line of treatment, ceases altogether to show a most dangerous symptom, and rapidly recovers flesh and strength.

Dr. McDonald (in Medical News, 1889) reports a case aspirated 31 times with the removal of 8,600 to 9,000 ounces of fluid, dating from May, 1888, to August, 1889, with apparent disappearance of symptoms and regaining health.

The conditions necessary for such a favorable result are, first, the patient must be comparatively young and his vessels in condition to accommodate themselves to new conditions. And, second, there must be no disease of heart, lungs or kidneys.

In conclusion, I would say that the following features are those to which I would like to call attention as most pertinent in my diagnosis:

(1) age; (2) strong alcoholic history; (3) history of dyspepsia; (4) primary enlarged liver; (5) secondary contracted liver; (6) hemorrhages; (7) ascites; (8) jaundice not marked.

THE RELATION OF MEMBERS OF THE FACULTY OF THE GEORGE WASHINGTON UNIVERSITY TO YELLOW FEVER INVESTIGATIONS.

By H. H. Donnally, A.M., M.D., Instructor in Bacteriology and Pathology.

When the Army Medical School was established in Washington in 1893, Major Walter Reed, of its faculty, was made Professor of Bacteriology and Pathology in our University. This position he filled with credit until his death, nine years later, and many of our alumni, including the writer, remember Dr. Reed with peculiar pride and gratitude because of the personal relation of teacher and student which existed between them.

Dr. James Carroll was elected Assistant Professor at the same time with Dr. Reed, and, upon the latter's death, was made Professor of Bacteriology and Pathology, his present chair. Surgeon-General George M. Sternberg, U.S.A., retired, holds the chair of Preventive Medicine in this University.

In view of the great achievements of these men of science and their vital association with this University, it seems appropriate that the subject of this paper be discussed in THE UNIVERSITY BULLETIN.

The first Havana Yellow Fever Commission was sent to Cuba in 1879. Dr. George M. Sternberg, U.S.A., who for years made systematic investigations into the etiology of yellow fever by bacteriological methods, was a member and secretary of this commission. Sternberg worked independently also in Vera Cruz, Rio de Janeiro, New Orleans and other southern ports. When made Surgeon-General, Dr. Sternberg was obliged to abandon his test tubes and microscope, his task unfinished, but his interest in it unabated, while he had as a result of his work Bacillus X recovered at autopsy from about half of the bodies dead of yellow fever, examined by him. The remarks of Prof. W. H. Welch, of Baltimore, at the banquet in New York City in honor of General Sternberg upon the latter's retirement in 1902, present authoritatively an estimate of Sternberg's work. As reported in MEDICAL NEWS, June 21, p. 1198, of that year, Dr. Welch said that "his work with yellow fever would stand forever. He said it was a common thing in these busy days to forget the steps which led up to any important discovery. All that Dr. Sternberg had done in the study of yellow fever was necessary work and it had to be done in just the way that he did it. The ground had first to be cleared; if it were not so the discovery had not been possible, and later discoverers themselves would have had to hunt out the large host of micro-organisms which Dr. Sternberg had described and laid aside. Dr.

Welch said that his careful work had practically resulted in the view that a bacteriological origin for this disease could not be claimed, and it was on *a priori* grounds that he himself had felt that Sanarelli's bacillus was not the cause of yellow fever. His study of others' discoveries was most careful and most critical; it was not wasted endeavor."

With such a scientist as head of the medical department of the army, it is easy to understand how in the summer of 1897 Major Reed and Dr. Carroll were assigned the work of investigating Bacillus X (Sternberg) and "Bacillus icteroides," the latter recently declared by Sanarelli in the *Semaine Medicale* (Paris, 1897, xvii, 253-255) to be the specific cause of yellow fever. These medical officers were especially qualified to undertake such a study by the nature of their work in the Army Medical School in Washington, and by special post-graduate laboratory work at Johns Hopkins Hospital,—Reed in 1890-91, when he studied pathology and bacteriology; Carroll studying pathology there in 1891-2, and bacteriology the following year, 1892-3.

The results of their work with these two organisms proved that Sternberg's Bacillus X was an atypical colon bacillus, that B. icteroides (Sanarelli) was a member of the hog cholera group, and that neither one of them bore any causal relation to yellow fever. These conclusions absolutely refuting Sanarelli and others regarding this micro-organism were published by Reed and Carroll.*

About one year before the appointment of the present Army Yellow Fever Commission, *Medical News*, April 29, 1900, comments editorially upon the question, "Is Sanarelli's Bacillus Icteroides the Cause of Yellow Fever?" The "Preliminary Note" of Reed and Carroll's investigation of this organism is there reviewed. The editorial concludes, "There remains open for ambitious American bacteriologists a very interesting problem of etiology (of yellow fever) whose study the United States' possession of Cuba and Porto Rico will greatly facilitate and whose importance can scarcely be overestimated. Any discoveries in this matter will confer lasting fame upon the investigators."

Some time after the above there was issued from the Government Printing Office the "Report of Medical Officers Detailed by Authority of the President (McKinley) to investigate the Cause of Yellow Fever," by Drs. Eugene Wasdin and H. D. Geddings, of the Marine Hospital Service. The first of an elaborate set of conclusions published in this lengthy report, is: "That the micro-organism discovered by Prof. Guiseppe Sanarelli, of the University of Bologna, Italy, and by him named 'Bacillus icteroides,' is the cause of yellow fever."

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*(1.) Medical News, N. Y., April 29, 1899, "Bacillus Icteroides and Bacillus Cholerae Suis. A Preliminary Note." Walter Reed and James Carroll.

(2.) Medical News, September 9, 1899, "A reply to Dr. G. Sanarelli," Walter Reed and James Carroll.

(3.) Proceedings American Public Health Association, Oct. 1900. "The Etiology of Yellow Fever. A Preliminary Note." Reed-Carroll-Lasear-Agramonte.

(4.) Journal of Experimental Medicine, December, 1900, (Received for publication Feby. 25, 1900), "A Comparative Study of the Biological Characters and Pathogenesis of Bacillus X (Sternberg), Bacillus Icteroides (Sanarelli), and the Hog Cholera Bacillus (Salmon and Smith)." Walter Reed and James Carroll.

On June 25, 1900, the Board of Army Medical Officers, Major Walter Reed, Drs. James Carroll, Jesse W. Lazear and Aristides Agramonte, appointed upon the recommendation of Surgeon-General Sternberg to investigate "the acute infectious diseases prevalent in the Island of Cuba," assembled at Quemados, Cuba, and at once set about their study of the cause and means of preventing yellow fever. For the first few weeks they made cultures from the blood of living cases of yellow fever and from the blood and organs at autopsies upon cases of this disease. "Bacillus icteroides" was not recovered by them in a single instance, whence they conclude:

"1. Bacillus icteroides (Sanarelli) stands in no causative relation to yellow fever, but, when present, should be considered as a secondary invader in this disease."

While these bacteriological investigations in Cuba were in progress, the board were discussing the mosquito as a possible agent for the transmission of the disease. Nineteen years previously this theory had first been advanced by Dr. Carlos J. Finlay, of Havana, who wrote and experimented persistently upon it after his first announcement. The season and the manner of spread of a yellow fever epidemic; the work of Ross and others upon malaria and its mosquito transmission; Finlay's theory; the observations of Carter upon the length of time between the arrival of the infecting case and the appearance of the secondary group of infected cases; these, together with their own observations after their arrival in Cuba, are mentioned by the board as factors leading them to determine to test to a conclusion the mosquito theory.

It is to be borne in mind that Dr. Agramonte was stationed and working in Havana, while Drs. Reed, Carroll and Lazear were quartered in Columbia Barracks, near Quemados, and the seat of their principal work. Here the members of the board working at first to produce further evidence, which they did not think was needed, to refute Sanarelli, Wasdin and Geddings, and a few others, were working out in their daily intercourse and discourse in the laboratory, at table, and elsewhere, the best plans for future procedure. It was the board as a whole (excepting Agramonte) which first formed the conclusion to investigate the mosquito theory.

"The line of work being finally determined, there at once arose the tremendous responsibility involved in the use of human beings for experimental purposes. After careful consideration, the Commission reached the conclusion that the results, if positive, would be of sufficient service to humanity to justify the procedure, provided, of course, that each individual subjected to experiment was fully informed of the risks he ran, and gave his free consent. The members of the Commission, however, agreed that it was their duty to run the risk involved themselves, before submitting anyone else to it.

"It became necessary just at this time for Dr. Reed to return to this country and the experiments were begun by Dr. Lazear." ("Walter Reed and Yellow Fever," p. 131-132, H. A. Kelly.)

When Major Reed left Cuba, August 4, 1900, (Kelly) Carroll and Lazear began to carry out the work agreed upon by them and Reed as described above by Dr. Kelly; Agramonte was intentionally kept in ignorance, by direction of Dr. Reed, of this plan of investigation. Dr. Finlay furnished them with mosquito eggs of the genus with which he had been experimenting. These were hatched and the adult mosquitos were infected by Dr. Lazear applying them to cases of yellow fever. He applied his infected mosquitos then to nine healthy non-immunes including himself, but all failed to develop the disease either because the mosquitos had not been kept sufficiently long after their infection or because they were applied to the yellow fever patients too late in the disease. On August 27, 1900, however, Dr. Carroll bared his arm in the laboratory and allowed Dr. Lazear to apply to it a mosquito which had twelve days before bitten a severe case of yellow fever on the second day of the disease, and had thereafter bitten three other cases at intervals of 6, 8 and 10 days. The following is taken from the "Preliminary Note" read before the Public Health Association in 1900:

"Of the two cases which we have recorded as positive in Table III, we now propose to speak at greater length.

Case 10. Dr. James Carroll, Acting Assistant Surgeon, U. S. Army, a member of this board, was bitten at 2 p. m., August 27, 1900, by Culex fasciatus. This particular mosquito had bitten a severe case of yellow fever on the second day of the disease 12 days before; a mild case of yellow fever, on the first day of attack, 6 days preceding; a severe case of yellow fever, on the second day of the attack, 4 days before, a mild case of yellow fever on the second day of attack, 2 days before inoculation.

Dr. Carroll remained well until the afternoon of the 29th, when he states that he felt tired and for this reason, when on a visit to Las Animas Hospital, the same afternoon (29th), sometime between 4 and 6 p. m., after visiting a few patients, he left the wards and waited outside on the porch, while his companions remained in the wards.

August 30th. During the afternoon, although not feeling well, Dr. C. visited La Playa, distant about one and a half miles from Columbia Barracks, and took a sea-bath.

August 31st., A. M. Dr. C. realized that he was sick and that he had fever, although he refrained from taking his temperature, but did visit the laboratory, distant about one hundred and forty yards, for the purpose of examining his blood for the malarial parasite. The examination was negative. During the afternoon he was compelled to take to his bed. At 7 p. m., temperature was 102 degrees F. No headache nor backache; only a sense of great lassitude. Eyes injected and face suffused.

September 1st, 7 A. M. T. 102 degrees F. Blood again carefully examined by Dr. Lazear with negative result. 11 a. m., T. 102 degrees.

The case having been diagnosed as one of yellow fever, Dr. C. was at noon removed to the yellow fever wards.

9 p. m., T. 102.8 degrees, pulse 90; 12 o'clock, midnight, T. 103.4 degrees, pulse, 84.

September 2d, 3 A. M. T. 103.6, pulse, 80. A trace of albumen was now found in the urine. The subsequent history of the case was one of severe yellow fever. Jaundice appeared on September 3d.

The accompanying chart No. 1 contains all of the necessary data."

Thus in the person of Dr. Carroll was given the first demonstration that the mosquito conveys the infective agent of yellow fever. For three days his life hung in the balance,—a rather anxious time for his wife and children (five) in Washington, who were, through the courtesy and kindness of Surgeon-General Sternberg, kept informed by the daily cable reports to him.

Dr. Reed, in Washington during this anxious and critical period, was most solicitous as to Carroll's welfare.

On August 31, four days later, with the same insect with which Dr. Carroll was brought down, and three other mosquitoes, Dr. Lazier infected a private soldier who passed through a mild attack of the disease.

The sad martyrdom of Lazear occurred on September 25, 1900, after an illness of one week with yellow fever brought on by the bite of a stray mosquito in the yellow fever ward where he was engaged infecting mosquitos for his experimental work, by allowing them to bite yellow fever patients. Although he had previously allowed himself to be bitten by an infected mosquito, he failed to develop the disease in consequence of it. It was accidental rather than a part of the program that he was bitten as he was. In the President's address, American Public Health Association, 1902, Dr. Henry D. Holton, says: "The patriotism of the military as they spring to the defense of their country, always deserves and receives the applause of the populace. Their deadly conflict on the battlefield is made easy by martial music, the booming of artillery, the rattle of the infantry fire, and the advancing step of comrades. How much more should we recognize the course of such devotees of science as Dr. James Carroll and Jesse W. Lazear, who, filled with a great philanthropic love for humanity, calmly, quietly, without the cheers or even the knowledge of the multitude, silently submitted themselves to the test to determine in what way this pestilence was communicated. We are told, 'Greater love hath no man than this, that a man lay down his life for his friend.' We find that Jesse W. Lazear, fired and impelled by his great love for his fellow man, did offer his body as a sacrifice upon the altar of scientific investigation, to the end that in the years to come hundreds of thousands might escape this pestilential death. * * * * * * *

"The practical result of all this work and sacrifice has been evidenced this past summer; not a case of yellow fever has originated in Cuba for the past fourteen months, the quarantine period has been shorter by three months; thousands of lives and millions of treasure have been saved and a feeling of security has filled the communities of the southern portion of our country."

In McClure's, June, 1906, Samuel Hopkins Adams, in an article entitled, "Yellow Fever; A Problem Solved," says:

"Lazear died, a martyr to humantiy, and is remembered by one where the lesser heroes of our Cuban battlefields are acclaimed by thousands. Carroll barely escaped with his life, and Reed, shrinking from no peril which his companions braved, came through unscathed by virtue of some natural immunity, only to die of another illness the following year."

The apparent inference of this statement is that Dr. Reed was intentionally bitten by an infected mosquito. There is no published record of such inoculation. As a matter of fact, mentioned above, Dr. Reed was in the United States while, in August and September 1900, Carroll and Lazear demonstrated by experiment in Cuba that the mosquito conveys the disease. Doubtless Dr. Reed would have willingly submitted himself had he been in Cuba at the time.

Dr. Reed returned to Cuba early in October (Kelly), and, after reviewing the experiments conducted during his two months absence, reported at Indianapolis, October 22-26, 1900, before the American Public Health Association, the "Preliminary Note" referred to above, the second conclusion of which was:

"2. The mosquito serves as the intermediate host for the parasite of yellow fever."

In order to recuperate, Dr. Carroll now returned home on leave of absence until about the middle of November, 1900.

On November 20, 1900, Camp Lazear, so named in honor of their dead colleague, was established near Quemados by the Commission for the purpose of confirming and continuing their work with yellow fever and the mosquito. Inoculation experiments with mosquitos and with yellow fever blood, and experiments with fomites followed in a most brilliant and well considered series until the latter part of February, 1901, and furnished the basis of several reports[*] by the Commission, which extended and rounded out their work and established their claim.

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[*] "The Etiology of Yellow Fever. An Additional Note." Reed, Carroll and Agramonte. Journal American Medical Association, February 16, 1901.

"Experimental Yellow Fever." Reed, Carroll and Agramonte, American Medicine, July 6, 1901.

"The Prevention of Yellow Fever," Reed and Carroll. Medical Record, October 26, 1901.

In the "Additional Note" (see foot note) the following are the published conclusions:

"1. The mosquito—C. fasciatus—serves as the intermediate host for the parasite of yellow fever.

"2. Yellow fever is transmitted to the non-immune individual by means of the bite of the mosquito that has previously fed on the blood of those sick with this disease.

"3. An interval of about twelve days or more after contamination appears to be necessary before the mosquito is capable of conveying the infection.

"4. The bite of the mosquito at an earlier period after contamination does not appear to confer any immunity against a subsequent attack.

"5. Yellow fever can also be experimentally produced by the subcutaneous injection of blood taken from the general circulation during the first and second days of this disease.

"6. An attack of yellow fever, produced by the bite of the mosquito, confers immunity against the subsequent injection of the blood of an individual suffering from the non-experimental form of this disease.

"7. The period of incubation in thirteen cases of experimental yellow fever has varied from forty-one hours to five days and seventeen hours.

"8. Yellow fever is not conveyed by fomites, and hence disinfection of articles of clothing, bedding or merchandise, supposedly contaminated by contact with those sick with this disease, is unnecessary.

"9. A house may be said to be infected with yellow fever only when there are present within its walls contaminated mosquitos capable of conveying the parasite of this disease.

"10. The spread of yellow fever can be most effectually controlled by measures directed to the destruction of mosquitos and the protection of the sick against the bites of these insects.

"11. While the mode of propagation of yellow fever has now been definitely determined, the specific cause of this disease remains to be discovered."

In the report entitled "Experimental Yellow Fever" the board recites the clinical features of the disease as manifested in their experimentally infected cases. In "The Prevention of Yellow Fever," the Stegomyia fasciata is described, its appearance, habitat, breeding places, mode of life, and so on, together with methods for its control and suppression. Dr. John Guiteras (American Medicine, November 23, 1901, p. 809) confirmed the infected mosquito work by producing eight cases of yellow fever by this means in Havana; three of them proved fatal.

This brings the work of the Commission up to the summer of 1901, when Agramonte was relieved, and Carroll was again sent to Cuba, this time alone, "for the purpose of continuing the investigation into the causation and prevention of yellow fever." During August, September and October of 1901 he conducted experiments which showed that the specific agent of yellow fever will pass through a Berkefeld filter so fine as to prevent the passage of the smallest bacteria. He further proved that partially defibrinated blood heated to a temperature of 55 degrees C. for ten minutes loses its infectiousness. He autopsied a case of Dr. Guiteras', which was the first fatal case of yellow fever experimentally produced, and found the lesions to be identical with those in non-experimental yellow fever. Dr. Reed writes to him, October 26, 1901, in reply to a letter summing up his summer's work:

"My Dear Doctor:

"I have just received your letter of the 22nd and hasten to congratulate you on the thorough manner in which you have accomplished the task assigned you. The results could not be better and throw a flood of light on the Etiology of Yellow Fever. * * * * We can now go ahead and submit a contribution on the etiology of yellow fever. This we must do promptly after we have discussed all of the later results. * * *

"Again, congratulations. Hoping to see you back soon,

"Sincerely yours,

"W. REED."

The next report [*] of the Commission was the "Supplemental Note," which described the work of Carroll last referred to.

All of the results of the American Commission have been amply confirmed, among others by the U. S. Marine Hospital Service at Vera Cruz, and in Brazil by a Commission from the Pasteur Institute, published in November, 1903. [†]

During the next year no new results were accomplished, their search for the specific organism in the bodies of infected mosquitos, sectioned and mounted, being unavailing, as it had been before in their studies in Cuba of mosquitos dissected in the fresh state; also from prolonged study of the blood of yellow fever patients, made by all of them, especially by Carroll, from the very beginning of their investigations.

In the fall of 1902, with slowly failing health, Reed suffered an attack of appendicitis, which resulted six days after operation in his death, November 22, 1902. His death was widely noted, especially by scientific bodies throughout the world, and his loss universally mourned.

There remained now but one member of the Commission, James Carroll, who since the death of Major Reed, has never been relieved from duty upon the Yellow Fever Commission. "Dr. Carroll's interest in the subject has continued unabated, and he has embodied the knowledge acquired during his unique experiences in several papers of the greatest interest." (H. A. Kelly, loc. cit., p. 257.) Ever on the alert and keeping apace with yellow fever matters and any 'new work' performed by its numerous recent investigators, Dr. Carroll has continued the good reputation and maintained the dignity of the American Commission, whose results have been universally confirmed and practically unsupplemented.

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[*] "The Etiology of Yellow Fever. A Supplemental Note." Reed and Carroll. American Medicine, February 22, 1902.

[†] "La Fievre Jaune," by M. M. Marchoux, Salimbeni et Simond. Annales de l'Institute Pasteur, November, 1903.

Dr. Finlay's assertions (Medicine, Detroit, March, 1903) that the Commission had not given him proper credit for his theory and work, made it necessary for Dr. Carroll to publish "The Transmission of Yellow Fever," (*The Journal of the American Medical Association, May* 23, 1903), in which he set forth from Dr. Finlay's published writings the latter's claim and methods of experimentation and showed that the Commission had arrived at their conclusions by more accurate and scientific measures, but still acknowledged Finlay as the exponent for years of the mosquito theory, demonstrated by the Commission.

Carroll's best work since Reed's death, however, is evidenced in "The Etiology of Yellow Fever. An Addendum" (*Journal of the American Medical Association*, November 28, 1903). It is here that he conclusively controverts the claims of Working Party No. 1, Yellow Fever Institute, U. S. Public Health and Marine Hospital Service. In their elaborate report upon "The Etiology of Yellow Fever," a "protozoan parasite" named by them, "Myxococcidium Stegomyiae" found in the bodies of mosquitos infected by biting yellow fever patients, was described and pictured in its various stages and in different locations in the mosquito.

An editorial in the same number of the Journal in which Dr. Carroll's refutation of these claims appears, says:

"Not long ago the Yellow Fever Institute of the U. S. Public Health and Marine Hospital Service issued the report of Working Party No. 1, in which is described a protozoan parasite found regularly in certain mosquitos that had bitten yellow fever patients. This organism is described in detail and given the name 'Myxococcidium Stegomyiae.' On the face of it this report appears to be one of the most important contributions yet made to the much-vexed question of the etiology of yellow fever. The question was, Would it stand the test of scientific criticism?

"In this number of the *Journal* Dr. James Carroll, of the U. S. Army, brings forward certain facts that tend to weaken one's confidence in the soundness of the conclusions of Working Party No. 1. Dr. Carroll shows that the fusiform stage of the *Myxococcidium Stegomyiae* cannot be connected with the transmission of yellow fever, and that the organism is a yeast fungus found quite commonly in mosquitos fed on over-ripe bananas purposely besmeared with yeast culture. Added to this we have the important fact that Dr. Carroll has not been able to find the organisms in mosquitos known to have produced yellow fever in human beings after they had bitten yellow fever patients early in the disease, the insects having been fed only on blood, dry sugar and water."

These results were duly and gracefully accepted by the officers of the Marine Hospital Service.

"Yellow Fever: A Popular Lecture," (*American Medicine*, June 3, 1905) delivered at Galveston, under the auspices of the University of Texas, is one of Dr. Carroll's recent papers. It posseses definite value as a means of popular education regarding the history, ravages and propagation of yellow fever, and how to exterminate the disease. Two thousand copies were, for this reason, issued by the University of Texas and in the New Orleans epidemic of 1905, 10,000 copies* were printed for distribution.

In "Lessons to be Learned from the Present Outbreak of Yellow Fever," (*Journal of the American Medical Association*, October 7, 1905), Dr. Carroll considers the last New Orleans epidemic; stressing the necessity for the recognition of those mild cases of the disease responsible for its introduction and continuance, he points to the necessity during the epidemic for a board of experts paid by the community to investigate every case of fever, for immediate report to the health department of the city when official means to prevent the further infection of mosquitos may be undertaken.

Reasons for believing that the specific organism of yellow fever is an animal parasite are systematically presented in "Without Mosquitos there can be no Yellow Fever," (*American Medicine*, March 17, 1906.) †

The value of the work of Major Reed, the ranking medical officer of the Commission, has been made so prominent since his death as to appear to eclipse the essential work of his colleagues, Lazear and Carroll, by whom was first actually demonstrated that the *Stegomyia Fasciata* is the source of yellow fever infection. The work of our Professor of Preventive Medicine, Gen. Sternberg, has been referrd to, and Prof. Welch cited upon its necessity as preliminary and fundamental to that of the Army Commission. No institution rejoices more in the achievements of one of its valued professors than does the George Washington University in the practical genius of Walter Reed. He was entitled to all he received, and it is hoped that his achievements will grow in renown and his personal qualities in the admiration and reverence of the world. But with the fame of Reed must also in justice be joined the equally important work of Carroll and Lazear, for it was these three men of the Army Commission, who, standing upon the foundation of what had been done before, made the discovery.

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*Verbal statement of the President of a parochial medical society.

†Other papers by Dr. Carroll are listed in "The George Washington University Bibliography, September, 1904," with its annual supplements.

Writing of Carroll, the only survivor, Dr. Kelly (Walter Reed and Yellow Fever, p. 256-7), says:

"All the reports of the Commission bear Dr. Carroll's name as well as that of Dr. Reed, and in reading them we should always bear in mind that, while the experiments were planned by the master mind of the chief, the accuracy with which they were carried out and the care by which all possible precautions were taken to exclude every source of error, are due to Dr. Carroll quite as much as to Dr. Reed."

In *Outlook*, August 11, 1906, pp. 834-35, appeared an editorial entitled, "The Republic's Forgetfulness," describing the work of the Reed-Carroll-Lazear-Agramonte Commission and its results, and asking, "What has the country done for the men who, at the hazard of their lives, have done so much for their country? Nothing."

I am informed that Dr. Lazear's widow receives a government pension of seventeen dollars per month.

In the Columbian University (now George Washington) after Major Reed's death, Dr. Carroll was made Professor of Bacteriology and Pathology; in the Army Medical School he was likewise given Reed's work as Professor of Bacteriology and Sanitary Microscopy; and made Curator of the Medical Museum; and in 1902 he was commissioned First Lieutenant. His promotion to the rank of Major in the Army Medical Corps has been talked of for several yëars:

"*Government Recognition for Brilliant Achievement.*—Some of the friends of Dr. James Carroll have from time to time suggested that his brilliant and courageous work in connection with yellow fever had won for him the right to some special recognition in official life and it has been suggested that the least that could be done for him would be to promote him to the grade of full surgeon, thus giving him rank and pay of a Major in the Army. We now understand that some of his friends are urging special legislation looking to such a step, and we believe *American Medicine* voices not only the feeling of Dr. Carroll's personal friends, but also of the entire medical profession of the country, when we say that this movement has our full endorsement and our best wishes for success. Dr. Carroll is now First Lieutenant and Assistant Surgeon. He has worked his way up from the ranks by hard, conscientious, faithful and courageous labor. We Americans have reason to be proud of him for his work, especially in connection with yellow fever." Editorial, *American Medicine,* November 26, 1904, pp. 906-907.

The following is taken from the Proceedings of the National Leglislative Council of the American Medical Association, published in the *Journal*, January 20, 1906:

> ### "REPORT ON GOVERNMENT RECOGNITION OF THE SERVICES OF DR. JAMES CARROLL.
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> "Dr. John S. Fulton, of Maryland, introduced the following:
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> "WHEREAS, In the Year of our Lord nineteen hundred, a Yellow Fever Commission was appointed by the Army of the United States to investigate the causes of yellow fever and to devise means for its eradication, the said Yellow Fever Commission consisting of Dr. Walter Reed, surgeon in the Army of the United States, Dr. James Carroll, Dr. Jesse Lazear and Dr. Aristides Agramonte, acting assistant surgeons in the Army of the United States; and
>
> "WHEREAS, The said Yellow Fever Commission, consisting of Dr. Walter Reed, Dr. James Carroll, and Dr. Aristides Agramonte (Dr. Jesse Lazear, deceased), did then and there determine the cause of yellow fever, and devise means for its prevention, by which means yellow fever was eradicated from Havana and Cuba, and thousands of lives have been saved in the United States and other parts of the Western Hemisphere; and
>
> "WHEREAS, Dr. Jesse Lazear, an acting assistant surgeon in the Army of the United States, did subject himself to the bite of an infected mosquito, from which bite Dr. Jesse Lazear suffered death; and
>
> "WHEREAS, Dr. James Carroll, an assistant surgeon in the Army of the United States, did subject himself to the bite of a mosquito infected with yellow fever, and suffered a grave and almost fatal attack of yellow fever, being the first attack ever experimentally produced: be it
>
> "RESOLVED, That the National Legislative Council of the American Medical Association expresses its appreciation of the valuable work accomplished by the Yellow Fever Commission in the interest of humanity, the material and bodily welfare of the people and of the Army of the United States, and of the heroism and devotion of the aforesaid Major Walter Reed (deceased), Dr. James Carroll, Dr. Aristides Agramonte and Dr. Jesse Lazear (deceased); and be it further
>
> "RESOLVED, That this Council commend to the Government of the United States adequate recognition of the gallant and meritorious services of the said Dr. James Carroll, the only surviving member in the Army of the United States of the said Yellow Fever Commission."
>
> This report was unanimously adopted by a standing vote.

It may be prophetic when Dr. Kelly entitles him *Major* Carroll throughout his book. Last April (1906) Senator Dick introduced a bill (Senate 5888) authorizing the President to place James Carroll on the retired list with the rank of Major. The bill was referred to the Committee on Military Affairs of the Senate. Is the medical profession to let it end there?

The work of the Army Commission is highly esteemed abroad. The following is taken from the President's Address,* 1906, British Medical Association:

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"In regard to yellow fever, Panama affords as striking an object lesson as Havana of the incalculable benefit to mankind that had followed the discovery of the cause of the disease and the manner of its transmission. The glory of the work which has had this striking consummation is shared by several men. The credit of the conception belongs to Dr. Carlos Finlay, who propounded the idea many years ago without attracting from the profession any attention but an occasional contemptuous notice. More fortunate than many true begetters of new truths, Dr. Finlay, at the meeting of the Pan-American Medical Congress, held at Havana in 1901, was acclaimed by the assembly as the author of the discovery which has already been so fruitful of good effects. Dr. Carter was another pioneer in the work which was brought to completion by the American Commission. Ultimately death snatched the reward from the hands of Walter Reed and Lazear, but Drs. Carroll and Agramonte still survive. It would, we think, be a fitting acknowledgement of the work of these four men if the Nobel prize were divided among them. It will scarcely be denied by any one conversant with the facts that their work is of far greater importance than that of several to whom the prize has been awarded in the past few years. The only original research work whose practical results can be held to compare with it is that which had brought malaria, that monster which till lately claimed so vast a tribute of human lives, within the control of man."

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*British Medical Journal, Sept. 8, 1906.

tive Council of the American Medical Association, published in the *Journal*, January 20, 1906:

"REPORT ON GOVERNMENT RECOGNITION OF THE SERVICES OF DR. JAMES CARROLL.

"Dr. John S. Fulton, of Maryland, introduced the following:

"WHEREAS, In the Year of our Lord nineteen hundred, a Yellow Fever Commission was appointed by the Army of the United States to investigate the causes of yellow fever and to devise means for its eradication, the said Yellow Fever Commission consisting of Dr. Walter Reed, surgeon in the Army of the United States, Dr. James Carroll, Dr. Jesse Lazear and Dr. Aristides Agramonte, acting assistant surgeons in the Army of the United States; and

"WHEREAS, The said Yellow Fever Commission, consisting of Dr. Walter Reed, Dr. James Carroll, and Dr. Aristides Agramonte (Dr. Jesse Lazear, deceased), did then and there determine the cause of yellow fever, and devise means for its prevention, by which means yellow fever was eradicated from Havana and Cuba, and thousands of lives have been saved in the United States and other parts of the Western Hemisphere; and

"WHEREAS, Dr. Jesse Lazear, an acting assistant surgeon in the Army of the United States, did subject himself to the bite of an infected mosquito, from which bite Dr. Jesse Lazear suffered death; and

"WHEREAS, Dr. James Carroll, an assistant surgeon in the Army of the United States, did subject himself to the bite of a mosquito infected with yellow fever, and suffered a grave and almost fatal attack of yellow fever, being the first attack ever experimentally produced: be it

"RESOLVED, That the National Legislative Council of the American Medical Association expresses its appreciation of the valuable work accomplished by the Yellow Fever Commission in the interest of humanity, the material and bodily welfare of the people and of the Army of the United States, and of the heroism and devotion of the aforesaid Major Walter Reed (deceased), Dr. James Carroll, Dr. Aristides Agramonte and Dr. Jesse Lazear (deceased); and be it further

"RESOLVED, That this Council commend to the Government of the United States adequate recognition of the gallant and meritorious services of the said Dr. James Carroll, the only surviving member in the Army of the United States of the said Yellow Fever Commission."

This report was unanimously adopted by a standing vote.

It may be prophetic when Dr. Kelly entitles him *Major* Carroll throughout his book. Last April (1906) Senator Dick introduced a bill (Senate 5888) authorizing the President to place James Carroll on the retired list with the rank of Major. The bill was referred to the Committee on Military Affairs of the Senate. Is the medical profession to let it end there?

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*British Medical Journal, Sept. 8, 1906.

THE EYE—FROM THE GENERAL MEDICAL POINT OF VIEW.*

By C. Norman Howard, M. D., Assistant-Physician, Out-Patient Department, University Hospital.

If the full effects of a particular disease could be traced, probably every tissue would reveal the sinister touch of its particular pathology. Intercommunication is reliable and swift, and following in its wake come the products of pathologic physiology, to depress the tissues and bear substantial testimony to an altered function and a suffering organ. The depression of remote tissues may be so brief and so slight that it has past before it can be assigned a place in the symptom group. In the other extreme, it may be so great that it overshadows at times the original lesion, as in the gastric crisis of locomotor ataxia, or the yellowish tinge to the skin following catarrh of the duodenum. There is a space between these two extremes which is not entirely filled with knowledge.

A disease may represent the center of a circle, and small arcs on the circumference all the tissues of the body. Thus we might tentatively place nephritis in the center and let each radius running from it terminate, and tell of the effect, upon the heart, the liver, the lungs, the eye and the lymphatics, etc., and if we could multiply the number until each organ or system had been drained of its crucial changes we would have a picture the study of which would preclude a mistake in diagnosis, because the picture would be the diagnosis. The name for it would be but a convenient title, even as pictures in the art galleries are known by their titles.

It is of interest to note that each one of the twelve main divisions of diseases (running the whole gamut from those due to animal parasites to those of the nervous system) has at one time or another been placed in the center of the circle and questioned as to its relation with eye pathology. This does not carry the implication that even the majority of the sub-divisions are held blamable, as far as our present knowledge is concerned, nor does it mean that I will recount more than will serve to illustrate my point of view.

In diseases of the blood and of the circulatory system, the eye is a potential field of information. In the examination of this fluid tissue and of this system we listen to it a little to the right of the left nipple line, and we feel it at the wrist and take away drops of it for observation and various tests. By instruments its power is noted and in old men we incidentally get partial shadows of it while taking some of the X-ray pictures. If there is then inserted a strong convex lens between the pupil and the ophthalmoscope there will be seen a bright yellowish-red background and resting upon it a terminal artery and the beginning of a vein; an integral portion of the system we are studying, actually at work in its own home. If there is a general change in the circulatory system, this terminal artery and this vein will not be slighted.

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*Read January 20, 1906, before The George Washington University Medical Society.

In arterio-sclerosis a retinal vein cannot be seen through the artery which crosses it, as formerly, because the latter has lost its translucency. There will also be found white stripes in the walls of the vessels where degeneration exists. In mitral disease (and in other conditions where there is a damming back of the blood from the head, as in emphysema or even in violent cough) the retinal veins are engorged and stand out big and thick compared with the retinal arteries, which have not undergone such radical change in size. Endarteritis may bring with it hemorrhagic retinitis, where the degenerating walls of the retinal vessels have given way. In this same disease of endarteritis there may be black specks floating across the yellowish-red reflex, and the patient sees them also and speculates as to cataract, whereas they are floating opacities in the vitreous. Then, again, a patient with arterio-sclerosis, or with aneurysm, or with valvular disease of the heart is suddenly deprived of his sight. A small fragment has broken loose from its moorings and traveled with the circulating blood until it has plugged an artery through which it could not pass. In this condition the ophthalmoscope may reveal an embolism in the retinal artery.

Under so-called diseases of the urinary organs, the inflammation of the retina occurring with nephritis is at once a valuable and an unfavorable sign. It is a sign which may, perhaps, be uncovered while making an unbiased ophthalmoscopic examination. The specialists tell us that two years after it is seen more than a slight majority of the patients are dead[1]. Here then is a finding of definite value in diagnosis and prognosis.

In diseases of the digestive system, constipation has been held responsible for some of the cases of recurring styes, and portal congestion for opacities in the vitreous.

It is of interest to note that in constitutional diseases as gout and rheumatism there is frequently associated a conjunctivitis, probably due to vaso-motor disturbance. In rheumatism we also have occasionally to contend with keratitis and optic neuritis. There is another class of constitutional diseases, especially in children, in which there is said to be a "depressed nutrition" or a "strumous condition," or "the general health is not good." It would seem as though all the organs were being as evenly depressed as the constituent parts of Oliver Wendell Holmes celebrated "One-Hoss-Shay." Or it may be that no organ wishes to cry out for help, for fear that it may be held responsible for the entire trouble, while its equally culpable associates escape the odium of censure. Be that as it may, in these cases in children the cornea tends to become involved. It will be remembered that the cornea is a non-vascular structure and has to rely for its nourishment on the courtesy of neighboring vessels.

Under the group of intoxicants, we find the baneful effects of both wood and ethel alcohol, in the production of blindness through optic neuritis. A heavy user of tobacco will come to the physician complaining that he cannot see as well as formerly, and he is found suffering from dimness of vision without visible changes in the eye——amblyopia. Large doses of quinine have caused total blindness, from which gradual recovery may take place, but probably never to quite the normal limits.

In the specific infectious diseases we find keratitis frequently following measles and chroiditis has here to be also taken into the reckoning. Conjunctivitis often adds its mite to the symptom group of smallpox and scarlet fever. As a sequel to diphtheria, usually during the second or third week of convalescence, ten to fifteen per cent. of the patients have a local paralysis. This occurs oftener in the palate than elsewhere. Next to the palate, the most common site is paralysis of some of the muscles of the eye, due to toxic neuritis of the third nerve[2]. Tuberculosis manifests itself in various portions of the eye. The ravages of gonorrhoea in the eye through external infection are well known. Probably the metastatic infection of the iris through urethal gonorrhoea is not so well known[3]. It is apt to make itself manifest in those cases in which there is articular involvement due to gonorrhoea. The metastatic infection of the eye in obstetrics and surgery has also had the earnest attention of our friends, the ophthalmologists[4].

Of all diseases which we can place in the center of our circle the one which stands out most clearly as a causative agent of eye pathology is syphilis. Beginning at the eyelids and going back through the conjunctiva, the cornea, the iris, the ciliary body, the vitreous, the retina, the choroid and the optic nerve itself we find the ugly touch of this social plague. Through gumma of the brain the muscles of the eye may be rendered helpless by pressure on their paths of innervation embodied in the 3rd, 4th and 6th cranial nerves. Not that every syphilitic has all or even one of these eye conditions, because no disease is uniform in its course. Were it so, medicine would rank with mathematics, and simple computations would take the place of masses of minutia in building up a diagnosis; nor on the other hand, are we debarred from using mathematics where we can. A patient may come to us complaining of uncertainty of vision, and he thinks it must be caused by his liver, because his eyes have acted queerly before when he was "bilious." Perhaps we concur in his diagnosis, or, perhaps, among our findings in the eye there will be a picture which resembles nothing so much as a dark red ball of clay, which being thrown against a yellowish-red wall has stuck until the center partially dropped away and left the rest of it sprawling there. Having found this peculiar distortion of the optic disk, we are minded to say he has optic neuritis and then we go forth groping for a cause and find that he had the initial sore of syphilis two years before.

At least three of the diseases of the nervous system have a diagnostic sign in the eye. Locomotor ataxia presents the Argyll-Robertson pupil, which contracts for near work, but not for light. The diagnosis of hereditary ataxia (Friedreich's Ataxia) is based on a group of symptoms of which one is the clonic rhythmical spasm of the external muscles of the eye known as "nystagmus." Multiple sclerosis is diagnosed by its volitional tremor, scanning speech and nystagmus. Hysteria, progressive paresis and tumors of the brain have each their eye manifestations.

And, lastly, if we enter the psychical arena we find the eye helping to express the mental state in happiness and in sorrow, in fear and in endurance. We find it steady with latent power in one patient of intellectual force, and shifting and weak in the incipient decay of another's will. And if a man is a general practitioner, studying the life problems of his patient, as well as his altered metabolism, these things too must add their quota to the diagnosis-picture.

In determining the relation between a given organ and the rest of the body, the foregoing alone would be incomplete. The remainder is obtained when the eye is taken from the circumference and placed in the center; when it ceases to be a partial index of other disorders and becomes the aggressor. Just what is this morbid influence through which the eye can affect the circumference? It is the pathologic physiology represented by errors of refraction and sometimes accompanied by muscle imbalance. It is eye strain.

It was my good fortune while serving on the staff of the Episcopal Eye, Ear and Throat Hospital, of this city, to examine 422 patients with especial reference to their vision. Some of my findings I have noted in the following table:

Unaided vision in the right eye was better than the left in 22 per cent, or 94 patients, of which number 52 had vision of 20-20th or over;

Unaided vision in left eye was better than the right in 36 per cent, or 151 patients, of which number 77 had vision of 20-20th or over;

Unaided vision was the same in each eye in 42 per cent, or 177 patients, of which number 86 had vision of 20-20th or over.

Both eyes had the same type of error (excluding presbyopia) in 79 per cent, or 333 patients;

Each eye had a different type of error in 17 per cent, or 73 patients;

Presbyopia, without other refraction error, was found in 4 per cent, or 16 patients.

The following shows the relative number of the different errors of refraction in those whose eyes have the same type of error:

	Per cent.	No. of patients.
Emmetropia (without error)	3	10
Hyperopia	41	136
Hyperopic Astigmatism	16	53
Compound hyperopic astigmatism	22	74
Myopia	6	21
Myopic Astigmatism	5	17
Compound myopic astigmatism	4	14
Mixed astigmatism	3—	8
Total	100	333

Presbyopia, with other refraction errors, which are included in the above list, 56 patients, making the total number of presbyopics 72.

Vision was tested under homatropine in 72 per cent, or 303 patients; 86 per cent of this number were also examined with the retinoscope, being 263 patients.

These patients include old and young, black and white, and male and female and the data was obtained in the majority of instances in the following manner:

A patient coming to the dispensary for the first time and apparently having an error of refraction, the vision was ascertained and he was told to report back early on the other afternoon in the week. At that time homatropine hydrobromate, grain one to the dram, was instilled in each eye. Starting an hour before my arrival, one drop was inserted at ten minute intervals until each eye had received six drops. He was then taken into the dark room and examined at one-half meter distance with a plane mirror retinoscope. This is an exact, objective, mathematical method of determining pathologic departures from the physiology of the eye. The pupil being dilated and the accommodation paralyzed it made any necessary ophthalmoscopic examination easy at this time. He was then tested with the cards and lenses. Although the effects of homatropine wear off in less than two days, it seemed best to not have them return on the other day that week, but to report back on the same day the following week. The accumulated data was then used in giving a final test and the glasses ordered. He was to secure the glasses the next day and wear them, and report back in two weeks with them. There were 159 patients out of the 422 in whom, it seemed to me, unnecessary to adopt the full method and it was curtailed in varying degrees with them. On the other hand, it was occasionally found that the homatropine had not sufficiently conquered a stubborn ciliary muscle and the patient was later given atropine.

My thanks are due Dr. Belt, the ranking officer on the staff, for the opportunity of serving these patients, and to him and the other members of the staff, Dr. Griffith and Dr. Lamb, for their aid in acquiring other clinical facts during my recent connection with the hospital.

In looking at the above figures it would seem that what might first attract attention is that 86 of these patients, or 20 per cent, had normal vision in each eye, and yet I found but ten who had both eyes normal. Then there were 129 other eyes distributed among patients whose vision was unequal which had normal vision; and yet I found but seven eyes divided among seven people which were normal. Now how were those eyes obtaining this normal vision? By working beyond their physiological capacity—by straining. And can we in safety say that this straining was only confined to them? Were not those in which the vision fell below normal not only making a greater effort against greater difficulties to accomplish normal vision and without the satisfaction of success? It has been interesting to note that, after the use of homatropine, patients have stated the eyes felt better; due to the rest received while lying in splints for two days.

Out of the great mass of material which has been written on eye strain, Dr. Gould apparently stands first as our most prolific and with his clear diction, most interesting of all those who have treated of this subject. It must not be forgotten, however, that thirty-one years ago Dr. S. Weir Mitchell called attention to eye strain in its morbid effect upon the rest of the body, and he was probably the first one who did so[5].

Dr. Gould tells us that eye-strain is the greatest cause of inflammatory disease of the eye itself[6].

The most important radius, which we can follow to the circumference, when the eye is in the center, is that leading to the nervous system. It must be remembered that we have a constant drain on this system in helping the eye to cover its deficiencies, and further that the nervous system cannot show constant favoritism to one organ without its own and other systems suffering.

Thus we find eye-strain a causative agent in many cases of occasional headache, constant headache and in that peculiar, periodic and painful afflication known as "migraine," or "sick headache." This last trouble frequently comes to those of a highly nervous organization, especially if they are men and women of education and culture, who not only read and write a great deal, but demand of their eyes a clear transmission of what can be seen, even as they demand of themselves and receive from their associates a clear mental picture of a subject. If reference be made to the figures given above, it will be seen that in 17 per cent, or 73 patients, the type of error was not the same for each eye. One might, for instance, be far-sighted and the other astigmatic. Only in 7 of this number was one of the eyes normal. Imagine for a moment one eye attempting to overcome its error and passing its result, such as it may be, back to the brain, only to meet the result which another eye has acquired while struggling with a different type of error, and then the two are to form one picture. Is it any wonder that the owner is disgruntled and forces them to do their utmost at all times? It is perhaps fair to suppose that this constant insidious strain eventually produces a little irritation which grows and grows and finally culminates in a nervous storm so great and so far-reaching that the eyes and head and digestive system are all involved. Those who are interested in seeing how Dr. Gould believes that eye-strain can mar the happiness of men will find melancholy pleasure in reading his "Biographic Clinics, giving the origin of ill health of DeQuincy, Carlyle, Darwin, Huxley and Browning."

Toward the close of my series of cases I made definite notes regarding headaches. That is, at the time the glasses were ordered the patient was questioned as to whether he had had headaches, and, if so, for how long and how often. When he returned in two weeks or later, having secured and worn the glasses in the meantime, additional notes were made.

These notes resulted in the following:

Total number reporting back in regard to headaches, 50;
Headaches made worse after wearing glasses, 6 per cent, or 3 patients;
Headaches uninfluenced by glasses, 6 per cent, or 3 patients;
Headaches relieved partially or completely after wearing glasses, 88 per cent, or 44 patients.

This does not include those who had errors of refraction and suffered from headaches, but did not report back after wearing the glasses.

Epilepsy has long been considered as probably due to a constantly acting slight irritation. Gould found in examining 68 epileptics that 98 per cent of them had astigmatism[5]. Some epileptic patients have definitely ceased having convulsions after the correction of an error of refraction.

Insomnia, chorea and hysteria have all been held up as due in some cases to eye-strain and with apparent justification. In regard to the effect on the digestive system, the nausea and vomiting associated with migraine have been referred to. Anyone who doubts that nausea can be caused by the eye has but to place a cylindrical lens before a neurotic astigmatic patient and turn the axis the wrong way. Errors of refraction must also bear scrutiny in tracing the etiology of seasickness and car-sickness.

Having examined the eye from the general medical point of view it might be well, in closing, to remember that it is not the intention to exalt this organ to a high plane of diagnostic value or etiological importance above its fellows. It has only been dealt with here exclusively because that was the subject matter of the paper. It has a diagnostic value and it has an etiological importance, but it ranks in each above some and below other constituent parts of the body, and it was largely to determine its relative position that a study of it appealed to me as a general practitioner.

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1. De Schweinitz—Diseases of the Eye.
2. Osler—Practice of Medicine.
3. Burnett—Journal A. M., Association, Dec. 23, 1905.
4. De Schweinitz—Univ. Penn., M. Bull, Phila., 1905-06, xviii, 78-81.
5. Gould—Biographic Clinics.
6. Gould—American Medicine, Oct. 10, 1903.

SYMPTOMATOLOGY AND TREATMENT OF EXOPHTHALMIC GOITRE AND REPORT OF CASES.*

By Dwight Gordon Smith, A.B., M. D., '03.

Exophthalmic Goitre since it was first brought to the notice of the medical profession almost a century ago, has been one of the most interesting and I may say one of the most mysterious diseases with which we are confronted. Always a fascinating study to the observer, of late it has become a source of an enormous amount of literature despite which, however, we still grope in the dark and the exact significance of the disease is yet unknown. On account of the latitude of the subject and the brevity of the time allowed me, I will devote myself entirely to the symptomatology and treatment of exophthalmic goitre, the two phases of the disease emphasized by the cases to be reported by me. These cases, eight in number, were treated in the service of Dr. James Dudley Morgan at the Emergency Hospital of this city, to whom I am indebted for his kindness in permitting me to make use of them. I also am indebted to Dr. W. E. Magruder, of Sandy Springs, Md., for data.

Exophthalmic goitre has five general symptoms which are now classic. They are nervousness, tremor, protrusion of the eyeballs, tachycardia and enlargment of the thryoid gland. These are always accompanied by secondary symptoms involving the various systems of the body. The thyroid gland is usually enlarged and in the majority of cases the enlargement is the first symptom noticed. The swelling may appear very slight until we remember that the normal gland can be rarely palpated and when a gland is of such size that it can be felt, we may be reasonably assured that it is diseased. The gland is seldom as large as it is in parenchymatons goitre. One lobe may be swollen more than its fellow and it is a curious fact that when such is the case the eye on the corresponding side protrudes more than the other. By reason of its increased vascularity the gland may pulsate but such was not the case with any of our patients.

The heart beats are accelarated and the face of the contractions increased. The pulse runs 90 to 150. Murray reports a case where it was 200. Cardiac murmurs may be present according to Gowers, Murray and Reynolds, but this was not found in any of my cases although one had a well marked hypertrophy of the left ventricle. Tachycardia occasionally is the first symptom to appear.

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*Read April 26, before The George Washington University Medical Society.

Exophthalmos usually develops after the previous ones have made their appearance. The eyeballs may protrude to such a degree that the patient presents a ghastly and unnatural appearance or the protrusion may not be perceptible. Usually the eyes have a startled, staring look. In some cases the upper lid does not follow the eyeball when it is turned downward but descends with a jerky movement.—Graefe's sign. It was noticed in two of our cases. Stellwag's sign, a widening of the palpebral fissue owing to the spasm of the elevator of the lid was presented by two of the cases to be reported. Moebius's sign is a deficiency in the power of convergence of the eyes. It is demonstrated by causing the patient to look at a finger as it is moved toward the eyes. They converge until a certain distance is reached then they suddenly become parallel. This was seen in one of the cases. Conjunctivitis was present in two, one had marked pterygium.

All of the cases were troubled with severe attacks of mental anxiety and nervousness. Two were apprehensive of sudden death. All had violent palpitation when they were at all frightened. Four suffered from insomnia. Three had severe pains in the lumbar region and two in the limbs.

Tremor of the hands or feet or tongue is present in a majority of patients according to Murray and Gray. It is usually fine and according to Osler about eight to the second. It may be very pronounced interfering with writing or sewing but such severe cases are rare. Two cases had tremor of the hands and tongue and three of the hands alone.

One of the cases had elevation of temperature, the others were normal. One complained of hot flushings, one of feeling cold. Profuse perspiration by day or night is common. Loss of hair is frequent. Two had polyuria. According to Ord, Murray and Taylor this is a common symptom. Diarrhoea, which Osler, Murray, McKenzie and Ord say is very frequent occurred only once in my series, while three of the patients suffered from constipation. Amenorrhea is often present in female cases, two of my cases had it. Emaciation in various degrees was a feature in seven out of the eight cases. In two instances it was extreme. Osler says eighty per cent of exophthalmic goitre occurs among women, some writers claim ninety-five. Three of this series were men which is a very high percentage of males. None of the observers whom I have consulted mention race as a predisposing factor in the causation of exophthalmic goitre and none puts any stress on its prevalence among negroes. Six of this series were negroes.

Treatment: There has been prescribed a multitude of drugs for the cure of exophthalmic goitre, and many therapeutic methods have been exploited. Nearly all have had their day and then been relegated to the past. Hygienic treatment is of importance as it is in other diseases, the conditions indicated being fresh air, good food, quietude, warm baths and a low altitude, the seaside being especially good. There is no need to send patients out of Washington as the climate here is favorable. Massage is beneficial in cases where the patients are confined to bed, but exercise is better when possible. Very severe cases should be treated by absolute rest in bed. Milk and a light easily digested diet should be ordered and rich food and stimulating beverages interdicted.

I will mention some of the drugs which have been employed in the treatment of this disease: Digitalis, strophanthus, opium belladonna, ergot, vetatrim-viride, iodine, iodides, bromides, salycilate of soda, phosphate of soda, thymus gland, and thyroid extract. One of the older methods of treatment still employed is that of inunctions of the ointment of red mecurial iodine. It is rubbed over the gland. The nervousness can be treated by the use of bromides. Anemia should be met with iron. For this purpose the elixir of iron, quinine and strychnine was given with success to several of my cases. Electrical treatment has its advocates, faradism being employed by Vigoroux, but others have not obtained the success that accompanied his treatment. Lockwood, Lewandoski and Charcot have employed galvanism. Hector McKenzie, Ord and Taylor do not advise it. Surgical interference has met with varying degrees of success. Some observers are enthusiastic, but others have not reported much success. The older operations were division of the isthmus, ligature of the thyroid arteries and denudation and exposure of the gland. The operations in vogue at present are Jonnesco's extirpation of the cervical ganglia and partial thyroidectomy.

The treatment employed on five of this series was the administration of sulphuric acid. About a year ago Dr. W. E. Magruder reported two cases of exophthalmic goitre treated by himself and three by his son, all of whom were cured by the use of sulphuric acid. Some years ago he had tried about every recommended agent in a very obstinate case of exophthalmaic goitre with no improvement. He then began the use of sulphuric acid with gratifying results. I will quote from Dr. Magruder's paper. He says: "While looking up the subject I was struck by the statement of Handfield Jones in his treatment of nervous diseases. 'Sulphuric and nitric acids certainly have some claim to be toners of the vaso-motor nerves, they cannot act in their original form on the parts which they influence as their quality must be lost the moment they enter the circulation.

They cannot be mere astringents like tannin. When sulphuric acid restrains choleraic purging or colliquative sweating, these effects must be surely produced by the nerves that regulate the arteries of the internal and external integument.' Something to give tone to the vaso motor system seemed to be indicated, so I determined to give sulphuric acid a trial." In addition to what Dr. Magruder says, Wood states that sulphuric acid is not merely a local astringent, but acts systemically.

Undoubtedly there is a vaso motor disturbance in exophthalmic goitre. Solis Cohen calls it a vaso-motor ataxia, Madison Taylor a cardio-vascular erethism. Such being the case theoretically the administration of sulphuric acid would seem to be a rational treatment of exophthalmic goitre. Dr. Morgan suggested that I try Dr. Magruder's treatment in the cases on our clinic. This suggestion was acted upon. Sulphuric acid was prescribed in six cases. One left the city, thus leaving five to be observed. Four are apparently well and one, who is still under treatment, has greatly improved and is practically cured. I will briefly report the five treated with sulphuric acid.

Case I. Louise C. admitted to the dispensary Dec. 28, 1904, colored, female, domestic, aged 34. For several months she had suffered from pains in chest, marked nervousness and insomnia. Exophthalmos was extreme, Graefe's sign was present. The pulse was 116, the thyroid gland enlarged. She also complained of leucorrhoea and constipation. She was advised in regard to hygiene and diet and was given sodium bromide and pills of aloin, belladonna and strychnine. She did not return until May, 1905, when her condition was much worse. The nervousness was increased and the gland larger. Aromatic sulphuric acid (twenty drops thrice daily) was prescribed. By the latter part of June she had greatly improved, the pulse being 96 and the nervousness ameliorated to a marked extent. The treatment was continued faithfully and on September 25, 1905, she was apparently well. She slept well, had no pain, the exophthalmos had subsided, the gland was reduced in size, pulse normal, the nervousness had disappeared and the patient had gained in weight. Since then she has had no return of her old symptoms.

Case II. Betty M, colored, female, domestic, aged 24, came to hospital July 25, 1905. She was extremely nervous and in great mental anxiety. She had tremor of the hands and tongue, swollen thyroid gland, marked exopthalmos, tachycardia (pulse 128), anemia and emaciation. She was given elixir of iron, quinine and strychnine and aromatic sulphuric acid (drops, twenty) three times daily. In one month she improved greatly, all symptoms decreasing. By

September 15 the exopthalmos had decreased and the thyroid gland had diminished in size and the patient was cheerful and contented. On November 29 the pulse was 79, the nervousness gone, the gland and the exopthalmos greatly reduced and the tremor had disappeared. She did not come back to the hospital until January 23, 1906, but there was no return of her previous condition. She was told to report from time to time.

Case III. William M. colored, male, laborer, aged 21, came to dispensary March 10, 1905. He had suffered from severe attacks of nervousness and mental anxiety for several months and had been troubled with malaise, anorexia and profuse night sweats. As he was rapidly losing weight he was tortured by the fear that he had tuberculosis. He had exophthalmos, tachycardia, enlarged thyroid and polyuria. He was given sodium bromide, returned to the hospital once and after that not until May 10, 1905. He was in a pitiable condition. The mental anxiety was extreme, simulating melancholia, the pulse 120, and the gland much larger. He was given aromatic sulphuric acid and immediately began to improve. On May 23, all symptoms were lessened, the pulse 101. This improvement kept up, each visit to the hospital showed a gain in his condition. By August his pulse was 81, the nervousness pains and polyuria had all disappeared, the exophthalmos reduced nearly to normal and the gland scarcely palpable. He has had no return of the symptoms since then.

Case IV. William B, colored, male, aged 20, entered dispensary March 20, 1906, complaining of pains in the chest and lumbar region, loss of weight and night sweats. He was in mental agony, fearing that he had tuberculosis. He also suffered from malaise, anorexia and shortness of breath, eyeballs protruded extremely. Stelwags and Moebius's signs were present and on the left eye was a pterygium. The thyroid gland was swollen and tremor of the hands was marked, the pulse 140, the apex of the heart was displaced downward and to the left, anemia was marked. He was given the elixir of iron quinine and strychnine and aromatic sulphuric acid, twenty drops three times a day, which was later increased to half a teaspoonfull. Ten days later his pulse was 72 and the nervousness and tremor had disappeared. He is still under treatment. He has gained in weight, appetite is good, night sweats have disappeared and the pulse is normal. Already the gland is smaller and the exopthalmos decreased.

Case V. Carrie S., colored, female, domestic, aged 36. Patient was always of a nervous temperatment, showing a marked neurotic taint. She came to the hospital December 7, 1904. For a year she had periods of feeling cold, which alternated with attacks of profuse perspiration. She had suffered from severe pains in limbs and chest and loss of weight. The exophthalmos was the most extreme of the series, the patient having a startled, staring appearance. The thryoid gland was quite enlarged, the tachycardia pronounced, pulse running up to 150 at the slightest provocation. The patient was emaciated and anemic. The peripheral veins were congested. The menstrual function had been suspended for a year. She was instructed in regard to hygiene and diet and thyroid extract was prescribed, also tincture of strophanthus. By December 29 she had improved very little and iron was ordered. For three months she came to the dispensary once a week with little or no apparent benefit. On April 28 she was given sulphuric acid. May 6 she was better, the pulse was 82 and the nervousness greatly relieved, the gland and the exophthalmos unchanged. During the summer she continued to improve in every way. By October the gland had become greatly reduced in size, the exophthalmos hardly discernible, and the nervousness, tachycardia, sweating, amenorrhea and pains were things of the past. She had increased in weight, and, as she expressed it, she felt like a new woman.

In conclusion, I will say that it is too early to state that sulphuric acid is a specific for exophthalmic goitre, but in view of the two cases cured by Dr. Magruder and three by his son and the five cases so greatly improved, and probably cured, in our clinic and no failures in the ten trials, sulphuric acid should have the benefit of a thorough test on every case of exophthalmic goitre.

ANNUAL ADDRESS OF THE PRESIDENT OF THE GEORGE WASHINGTON UNIVERSITY MEDICAL SOCIETY.*

By A. Barnes Hooe, M.D., '96.
(Gynecologist, Out-Patient Department, University Hospital.)

Gentlemen: During the summer of 1905, several Alumni of the Medical Department of The George Washington University deemed it advisable to form a medical society in this city whose membership should be composed of Alumni of this Department. On September 23d, a call, signed by ten Alumni, was sent out to all of the body who were resident in Washington and vicinity to meet in the medical building of The George Washington University on October 7th to consider the advisability of such an organization. About fifty responded, and decided to form such a society; and a committee was appointed to prepare a constitution and by-laws and to submit them for consideration at a subsequent meeting. On October 27th, at a meeting held at Rauscher's, a permanent organization was effected, a constitution was adopted and officers were elected. About eighty were present at this meeting, including •Dr. Needham, President of the University, and many of the medical faculty in addition to the Alumni.

In the selection of officers, the Society saw fit to bestow upon me its highest honor by electing me its first President, an honor which I sincerely appreciate. We have passed one year of successful activity with ever-increasing enthusiasm and interest and our members have presented at our monthly meetings many valuable scientific papers. Now at our closing meeting it becomes my duty to make the annual address as President prescribed in the constitution, and I trust you will bear with me while I sketch the history of the Medical Department of The George Washington University; with the limited time at my command, my address must necessarily be brief.

In the early days of our Colonists the care of the sick was mostly in the hands of the clergy, who deemed it their duty to look after the physical, as well as the spiritual welfare of their parishioners. While early American history informs us that there were at times physicians among the Colonists, as in the case of the physician who accompanied Captain John Smith in his expedition up the Potomac River, yet we are led to believe that they were not always at command, for later, when Captain Smith was injured by an explosion of gun-powder, he had to return to England for surgical care. Our early American medical history is very interesting and some of its accounts curious. The first American publication in this field was a book-let entitled, "A Brief Guide in the Smallpox and Measles," written and published in 1677 by a clergyman, and the second, which followed about two years later, entitled "A Good Management of the Distemper of the Measles," was also by a minister of the gospel.

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*Presented at the first annual meeting of the Society, held at Rauscher's, May 19, 1906.

We learn that early in the eighteenth century there were a few regular physicians, educated in Great Britain, scattered about among the Colonists, but not until about 1750 was any effort made to give our young men careful instruction in medicine. The little they could learn from the few physicians in the country was by talking with them and using their very limited libraries.

The first serious attempt at teaching medicine was in 1756, when Dr. William Hunter, a celebrated Scotch physician, delivered a course of lectures in Newport, Rhode Island, to which all medical students, physicians and cultured men of the city were invited. In 1765, two young Americans who had been educated in Edinburg, started the first medical school in America in the city of Philadelphia, which was first connected with the College of Philadelphia, and became ultimately a department of the University of Pennsylvania. This school being a success, New York organized a school two years later known as the Medical Department of King's College. Fifteen years later the Medical School of Harvard was organized, and was the third in America. Although Harvard College was organized in 1636, not until 1782 was a medical school attached to it. The fourth medical school to be founded was that of Dartmouth, which was organized in 1797; for the first twelve years it had only one professor, who taught all the branches of medicine and graduated a number of physicians. Then followed:

5th. The College of Medicine of Maryland in 1807.

6th. The College of Physicians and Surgeons of the Western District of the State of New York in 1812.

7th. The Medical Department of Yale in 1813.

8th. The Medical College of Ohio in 1818.

9th. The Vermont Academy of Medicine in 1818.

10th. The Medical School of the Transylvania University in 1818.

11th. The Medical School of Maine in 1820.

12th. The Medical Department of Brown University in 1821.

13th. The Medical Department of the University of Vermont.

14th. The Berkshire Medical College at Pittsfield, Mass.

15th. The Medical College of South Carolina.

16th. The Medical School of Jefferson College, Philadelphia.

17th. The Medical Department of the Columbian College, now the Medical Department of The George Washington University, which was chartered the 9th day of February, 1821, but did not begin a regular course of lectures until 1825.

About 1817, Rev. Luther Rice conceived the idea of establishing a College in the District of Columbia and in 1819, a tract of land embracing about forty-seven acres, situated between Fourteenth and Fifteenth Streets N. W., and north of Boundary Street, (now Florida Avenue) was purchased for about $7,000. A building was erected at a cost of about $35,000, which was sufficiently completed to allow the opening of college in 1822. Congress had granted a charter to Columbian College which was signed by President Monroe on February 9, 1821. This charter empowered the trustees and faculty to establish academic and professional schools and to confer degrees. The following schools were at once projected: Preparatory, Collegiate, Theological, Law and Medical. The records show that the first classes were gathered together in 1822 and the first graduates received their diplomas in 1825, but the official Alumni list shows the names of Alexander Ewell, of Virginia; Albert Fairfax, of Virginia, and James D. Knowles, of Rhode Island, as Alumni of the class of 1824.

It appears from the records that the Medical Department was not fully organized until 1825, but it is more than probable that medicine was taught from the beginning, as we find among the first professors, Dr. Thomas Sewell, Professor of Anatomy and Physiology and Dr. James M. Stoughton, Professor of Chemistry, Geology and Surgery, both of whom were elected in 1821; Dr. Thomas Henderson, Professor of Theory and Practice of Medicine in 1824; Dr. Nicholas Worthington, Professor of Materia Medica in 1824; Dr. Alexander McWilliams, Professor of Botany in 1824, (elected to the vacancy caused by the death of Dr. Craven.) It is altogether probable that these gentlemen were giving instruction in their respective branches before 1825.

A digression is permissible here to pay tribute to Professor Thomas Sewell and also to the Trustees for their wisdom in selecting him as the Senior Professor in the Medical Department. He became the bone and sinew of the school and from his published works alone we can gather the history of the Medical School prior to 1839. The Medical School became a complete department in 1825; Professor Thomas Sewell delivered the opening address on March 30th of that year, a copy of which is preserved in the United States Army Medical Library and also in the library of the Department of Medicine.

Just when this address was delivered, or where the original medical building was located, is unknown, but it is probable that it was on the College grounds. There is an old record to the effect that the first building occupied by the Medical School was erected by the Professors themselves, but the location is not given.

The first class to receive the degree of Doctor of Medicine was in 1826, there being seven graduates; and from this time up to and including 1834, classes were graduated yearly. From 1834 until 1839 there is no record of a continuance of the Medical School, but in June 1839, at the request of Professor Sewell, there was a meeting of physicians at his office, the object of the meeting being to consider the practicability of attempting to reorganize the Medical Department of Columbian College. There were present upon that occasion, Drs. Thomas Sewell, Thos. P. Jones, Harvey Lindsly, Thomas Miller, J. M. Thomas, J. F. May, J. C. Hall, and Frederick May. It was decided to reorganize, and the following gentlemen were elected to fill the chairs: Professor Sewell, Pathology and Practise of Medicine; Professor Thomas P. Jones, Chemistry; Professor Lindsly, Obstetrics and Diseases of Women and Children; Professor Thomas Miller, Chirurgery and Practise of Surgery; Professor J. W. Thomas, Materia Medica; Professor J. F. May, Anatomy and Physiology.

Dr. Sewell was elected President of the Faculty and Dr. May, Secretary. The Faculty decided to hold the lectures in a central section of the city and a committee was appointed to procure a satisfactory building. They at first decided upon the Purdy Building on Four-and-a-half street and Louisiana Avenue N. W., and signed a five-year lease for it, but before taking possession, it was deemed wiser to lease a building at the corner of Tenth and E streets northwest, from General Van Ness. Upon the payment of $100, Mr. Purdy released them from the contract for his building. The money for the rental of the Van Ness Building, ($600 per annum), was to be raised among the faculty.

The first catalogue was issued in August of that year, and spoke particularly of the facilities for work in Anatomy, Chemistry, Practise of Medicine and Surgery and also stated that the students would be required to perform operations upon the cadaver. The course began the first of March, and two courses of lectures were necessary to become eligible for the Degree of Doctor of Medicine. At this time, private articles of agreement of curious interest were entered into by the Faculty, as follows:

> "First. To exercise toward each other at all times a spirit of courtesy, kindness and forbearance.
>
> Second. To endeavor to secure for each other as far as possible, the confidence and respect of the Medical Class.
>
> Third. To impart to each other any suggestions and to give any advice which may be useful to the school or to themselves as individuals.
>
> Fourth. To see that the opinions and doctrine of each Professor in his proper branch are not to be controverted or animadverted by any other Professor, and a spirit of deference and respect is to be cherished towards each Professor in all things which appertain to his particular branch, in which he is regarded as authority.

> Fifth. In case of the existence of any prejudice or misunderstanding between two or more members of the Faculty, it shall be our duty to bring about a satisfactory explanation and reconciliation. In the event of a failure to accomplish this, the case shall be referred to the Board of Trustees, whose decision shall be final and satisfactory to all the parties."
>
> "The spirit of the foregoing agreement we consider as extending to our professional and private interest and character as well as our character and interest as Professors."

At a later date the following articles were added to the above:

> "WHEREAS, the harmony and personal confidence of members of this Faculty are considered indispensable to the permanence and prosperity of the Institution, it is therefore resolved that we cannot be too strict in the observance of these rules of propriety and etiquette, which should govern its Professors."
>
> "*Resolved,* That every physician has a right to regard the individuals and families who have solicited him as their medical attendant as he would regard his own family, free from all interference of his professional brethren, and that it is unworthy of the purity and dignity of the physician, and especially of the Professor of the Medical College, where it becomes his duty to inculcate both precept and example of a correct system of medical ethics, to endeavor, directly or indirectly by himself or by the hands of another, to insinuate himself into the favor of any individual or family with a view of becoming their physician when such families or individuals have already selected their medical attendant."

The Faculty was evidently composed of very unselfish men, who w working to promote medical education because they thought it t duty and certainly not because of the pecuniary compensation, as proved from the record of March 17, 1843. This record shows tha the close of the Dean's books for that year, there was but one hund and twenty-six dollars and forty-five cents on hand, which was ev divided among the six members of the Faculty. This is the first re ence to their having received any compensation at all, while there many recorded statements of assessments of the Faculty to raise necessary amounts for the current expenses of the school.

On the 6th of November, 1843, a Medical Dispensary was opened the medical building where clinics were given daily, except Sunday. June 15, 1844, the following bill passed the United States Congress:

> "And it is further enacted, That the Commissioner of Public Buildings be directed to allow the Medical Faculty of the Colum-

> bian College, District of Columbia, to occupy the Insane Hospital, with the adjoining ground situated in the Judiciary Square in Washington, for the purpose of an Infirmary for medical instruction and for scientific purposes, on condition that they shall give satisfactory security to keep said building in repair and return it, with the grounds, to the Government, in as good condition as they are now in, whenever required to do so."

The Faculty took possession of this hospital July 1st of that year and called it the City Hospital. The school continued here until 1861, when the Faculty were required to return the building to the Government, and it was occupied as the United States Army Hospital until November 3, 1861, when the whole structure was destroyed by fire.

In April, 1845, the Medical School sustained a great loss in the death of Professor Thomas Sewell. On March 1, 1847, with the consent of the trustees, the name of the Medical Department was changed to that of the National Medical College. In 1861, there were graduated twenty-four students, among whom we find the name of one who is endeared to every graduate from this school in the past third of a century, and whom we sincerely trust an all-wise Providence will continue with us for many years to come. I refer to Professor A. F. A. King, for so many years Dean of the Department.

In the fall of 1861, having vacated the Government building, the School was removed to a building on E Street between Eleventh and Twelfth Streets N. W., known as the Constitution Office. On April 1, 1862, steps were taken to secure the building situated where our present medical building is now located. The Civil War being at this time in progress, several of the Faculty had responded to the call of their country and the number of the students was very small. As the result, it was deemed advisable to suspend during the course of the Session of 1863-'64.

On July 29, 1865, the Faculty reassembled when they were informed by the President of the University that Mr. W. W. Corcoran had presented the building located at 1325 H Street N. W., to the Medical School. But the War Department had possession of the building and refused to vacate it immediately. Lectures were therefore begun in the law building. On January 31, 1861, Dr. J. Ford Thompson was elected to fill the chair of Anatomy and Physiology. In July, 1866, Dr. A. F. A. King became adjunct to the Chair of Materia-Medica and the late Dr. D. W. Prentiss (father of our present Secretary), whom most of us remember so pleasantly, became adjunct to the Chair of Chemistry. At a meeting of the Trustees of the University on October 25, 1866 it was decided that all the members of the Faculty should be elected annually, to which the Medical Faculty demurred, and on October 27th, the Medical Faculty resigned in a body, but upon the request of the President, they agreed to withdraw their resignations.

On November 21, 1866, the building presented by Mr. Corcoran was formally accepted and the introductory lectures given therein. On July 10, 1872, the Chair of Surgery was committed to one who has so ably filled it up to the present time, Professor J. Ford Thompson.

It was necessary from time to time to make changes in the building to accommodate the increase in the number of students, but no great change was made until 1887, when the building was very much enlarged and the laboratory facilities greatly improved. Since leaving the City Hospital in 1861, the School had depended for clinical facilities upon the use of wards of the different hospitals throughout the city. For years efforts had been made to erect a hospital under the control of the Medical School, but not until 1898 were they successful, when a small hospital was opened where our new hospital now stands. As the school had grown so rapidly and the members of the Faculty were anxious to keep abreast of the times they deemed it advisable, under the leadership of our late Dean de Schweinitz, to have a more modern and larger Medical Building and Hospital, and therefore, the old building of both the Medical School and Hospital were replaced in 1902 by the commodious modern buildings now occupied by the Medical School and The George Washington University Hospital.

The Hospital, as you all know, is a modern and up-to-date building capable of accommodating one hundred patients. In the wards of this hospital our graduates of today receive their daily clinical instructions in all the branches of medicine and surgery.

On September 1, 1904, the name of the University was changed from the Columbian University to The George Washington University, a name which in itself makes it, so to speak, a national university and one which if properly fostered, as we all believe it will be, is destined to become one of the great universities of these United States. As the result of the wise policies of President Needham and the able leadership of Dean Phillips, our department is steadily advancing toward the realization of its high ideals and with enthusiasm and hope we face the future. The medical Alumni, we believe, are thoroughly loyal to their Alma Mater, and it is our duty to co-operate with each other in every way possible that banded together for large achievements, we may add to the prestige of our institution as a whole and contribute in no small measure to the success of the Medical Department of The George Washington University. If it succeeds, as it certainly will, we have done no more than our duty; if it should fail, then Fellow-Alumni, we are to blame.

SCIENTIFIC NOTES.

Dr. J. Ford Thompson, Professor of Surgery, has been granted a year's leave of absence and has presented his resignation, to take effect at the close of the session of 1906-'07. His colleague, Dr. A. F. A. King, formerly Dean of the Department of Medicine, characterizes the services of Dr. Thompson to the University as follows:

"It has become a common custom in this world to laud those who die. But why not extend our meed of praise also to the living? Certainly no man more fully deserves such commendation than our distinguished Professor of Surgery, Dr. J. Ford Thompson, who, after forty years of service, first as Professor of Anatomy and later as Professor of Surgery, has recently tendered his resignation of the latter chair. Succeeding the late Dr. Thomas Miller, Dr. Thompson began to lecture on anatomy in the University in 1865. A few years later (1872) he became Professor of Surgery and has continued to perform the duties of that chair until the session of 1905-'06, when he delivered his last course of lectures to the Medical Class."

"As a teacher of surgery, Dr. Thompson's method of instruction was pre-eminently practical. A fearless and skillful operator in all departments of surgical work, he was able to demonstrate the principles and methods taught in the lecture room by clinical examples in the several hospitals where, for so many years, he performed the duties of an attending surgeon. Always punctual and conscientious in the onerous duties of his university and hospital appointments, with a more than humane indifference to pecuniary reward, Dr. Thompson, in his retirement from the Medical Faculty, carries with him the unlimited esteem and affection of hundreds of students who have profited by and enjoyed his instruction, and also the warmest personal regard and best wishes of his colleagues in the Medical Faculty."

In connection with the paper appearing in this number on "Yellow Fever Investigations," it is interesting to note that as early as February, 1883, Dr. A. F. A. King, Professor of Obstetrics and Dean Emeritus, read before the Philosophical Society of Washington, a paper entitled "Insects and Disease, Mosquitoes and Malaria." (*Popular Science Monthly*, xxiii No. 5, Sept. 1, 1883). In his paper Dr. King presented a "series of facts--some of the best known and most generally established facts—with regard to the 'malarial poison' and showed how they may be explicable by the supposition that the mosquito is the real source of disease, rather than the inhalation or cutaneous absorption of marsh-vapor." Dr. King mentions Dr. Josiah Nott, of Mobile, Ala., who published in 1848 an essay on yellow fever, in which the mosquito is referred to as the probable cause of malaria and yellow fever,(*New Orleans Medical and Surgical Journal.* iv, 563-601, 1848).

Dr. Nuttall in a paper discussing the mosquito-malarial theory ("On the role of insects, arachnids and myriapods as carriers in the spread of bacterial and parasitic diseases of man and animal. A critical and historicl study." By Geo. H. F. Nuttall, M.D., Ph.D., Johns Hopkins Reports, Vol. VIII, 1899.) says:

"In 1883 a most elaborately stated argument was published by King, in which he brings together a mass of evidence on the subject, vastly more, in fact, than other authors have since gathered, and I shall often have occasion to refer to his paper. It is curious to look over the more recent literature on the subject to see how writers have rediscovered the mosquito-malaria theory. In France the theory is ascribed to Laveran, in Germany to Koch and Pfeiffer, in England to Manson, whilst in Italy the names of Bignami, Mendini and lastly, Grassi are identified with it. By far the most masterly theory was written by King." All of these other scientists made their announcements of this theory between 1891 and 1898. Dr. King did not claim to have proven his theory but hoped that others might be stimulated to establish it by experiment. In closing he presents means of prophylaxis against malaria by protection against mosquitoes and their destruction—means which hold today.

Dr. George N. Acker, Professor of Pediatrics and of Clinical Medicine, has a suggestive paper in THE AMERICAN JOURNAL OF OBSTETRICS, October, 1905, on "The Diagnosis and Treatment of Pneumonia in Children." He believes that a patient with pneumonia, as those suffering from other diseases of the lungs, should have a large amount of fresh air. Many (this includes some physicians) appear to consider it a sin to allow any fresh air in the sick-room, but think that the little one must be kept in a hot, close room with woolen goods or cotton jacket about the chest. In a case in which the author was a consultant last winter, the infant was in a room 15 by 17 feet. There were four persons present, and a large gas stove helped to heat the room. The temperature was about 80 degrees F. and the windows were closed. The little patient was enveloped in heavy clothing. There was marked respiratory dyspnea and cyanosis. The child was dying for want of fresh air. The physician in charge was a capable man, and he explained to the author that it was impossible to get the parents to observe the proper hygienic measures.

The diet is of the greatest importance, for the digestive organs must be kept in good condition. If the temperature of the child is high, sponging with cool or tepid water will allay the nervous symptoms and promote rest. Small doses of the sweet spirit of nitre or solution of acetate of ammonia (if neutral) will have a good effect on the fever, but the coal-tar preparation must not be used for this purpose. Expectorant medicines are not of any, or are of little, value in the disease, and often impair the digestion. The carbonate of ammonium and aromatic spirits of ammonia are at times useful as respiratory stimulants. Alcohol and strychnine will be necessary in many cases when the vital forces are on the wane. If the cough is harsh and dry, the air should be kept in a moist state, and the croup kettle (with compound tincture of benzoin in the water) is admirable for this purpose. Unless the cough is very troublesome it does not require treatment, and certainly one must be cautious in the use of opium, for if given to relieve cough it interferes with the secretions and embarasses the respiration. It is necessary for the patient to cough to remove the mucus from the bronchial tubes. A teaspoonful of hot water will often have the effect of quieting the cough. A mild mustard plaster is often of service. The chest can be rubbed with camphorated oil or Roche's embrocation, this latter being a favorite application with the author. It is a fad at the present time to apply clay preparations to all the ailments of the body; but as the author has observed blisters produced by the application of one of these on several infants he warns against their use—he has never noted any good from them in cases of pneumonia.

The heart's action and the skin must be watched, and if the former shows any signs of fatigue or the latter any cyanosis, increased stimulation must be resorted to and warm mustard baths and dry cups may be employed.

Beverly Robinson, who has paid considerable attention to the prevention of pneumonia, has observed that the micrococcus lanceolatus is one of the least tenacious of life among the pathogenic microörganisms, and that it does not thrive in an acid medium; therefore, he recommends the frequent use of acid mouth washes in times when the disease is prevailing. The sputum, stools, and urine of the patient should be destroyed, and the mouth washed frequently with an antiseptic solution. The antipneumococcic sera have not been found to have any marked benefit, though some have thought that there has been a slight reduction in the mortality shown. Even those who have given the serum in large doses have not been able to report any great success. One of the prime factors in the treatment of pneumonia is to watch the condition of the stomach and bowels, for in nearly every case there is great disturbance of these organs. The food must be such as will easily digest and cause no fermentation. If the stomach and bowels keep in good condition, the battle is half won. Milk should be diluted and not given in too large quantity at a time. The child should be fed at regular intervals, and plenty of good water given. The bowels should be opened at the commencement of the disease with castor oil or calomel, and afterward kept open by enemata.

Dr. D. Kerfoot Shute, Professor of Anatomy and of Clinical Ophthalmology, has just published in the NEW YORK MEDICAL JOURNAL for August 18 and 25, an article entitled, "A Model for a New Ophthalmotrope; the Gonioscope. Some Phases of Ocular Motility." In this article he describes a model for a new ophthalmotrope, which he constructed and exhibited before the Society of Ophthalmologists and Otologists of Washington, D. C., and also before the Medical Society of the District of Columbia.

Unlike all other existing ophthalmotropes, Dr. Shute's model is based upon the principle of diversity instead of community of the axes of rotation for the superior and inferior recti muscles and for the oblique muscles. His ophthalmotrope is for the purpose not only of studying the physiological movements of the eyes, but also for investigating pathological rotations of the eyes. All current text books upon physiology and ophthalmology adopt the theory of community instead of diversity of axes of rotation, and thus bring the teachings of physiology and ophthalmology into inexplicable conflict with the whole clinical experience of the past in diseases of ocular motility. Dr. Shute's model demonstrates with precision and ease the accuracy of this vast clinical experience accumulated by the masters in ophthalmology during the last three or four decades. His studies in ocular motility led him to devise a simple apparatus for which he coined the name gonioscope (*gonia* angle; *skopein* to view). This instrument is for the purpose of noting the varying angles made by the optic axis (in different positions of adduction and abduction of the eyes) with the lines of force (muscle lines) of the two oblique muscles and of the superior and inferior recti muscles, and for aiding, therefore, in understanding the theoretical effects of contraction of a single one of the above-mentioned muscles; all of which is a necessary preliminary to a correct appreciation of the symptoms of a single ocular muscle when paralyzed.

Dr. Shute states in his article that the ophthalmotrope and gonioscope devised by him were the outcome of his own difficulties in the study of ocular motility—one of the most complicated and involved subjects in the whole range of ophthalmology. Because the facts of physiological as well as pathological ocular motility are so difficult for the average student, and even for many ophthalmologists to understand. Dr. Shute has also published in his article several (four) original diagrams, illustrating ocular rotations. For details upon the subject, the reader is referred to the article in the NEW YORK MEDICAL JOURNAL.

Dr. Sterling Ruffin, Professor of The Theory and Practice of Medicine and of Clinical Medicine, in the April, 1906 number of the *American Journal of the Medical Sciences,* reports at length on "Hodgkin's Disease, with the generally accepted plan of a practically exclusive milk or so-called "liquid" diet and advocates the employment of a more liberal and varied diet than that in general use.

On the basis of published metabolism and digestion studies in actual cases, he has endeavored to work out the theory or principles of typhoid dietetics on the same basis and the same kind of data as have served for the scientific establishment of the recognized principles underlying dietetics in health and infant feeding. By these methods he has determined a standard for feeding typhoid fever patients (2,000 calories of energy and 100 grams of proteid daily) that may be accepted tentatively until further investigations directly to this end may fix it definitely. Digestion experiments were found to show that, contrary to the prevailing belief, the digestive powers in typhoid fever are on the average lowered only five to ten per cent. Consideration of other factors seemed to show that the present fears and objections to soft and solid food are unfounded, and that a mixed diet really is less objectionable than the "liquid" diet now in use.

The actual results of varied and generous feeding in typhoid fever were found to corroborate the conclusions derived from theory. Patients so fed were more comfortable, convalesced in a much shorter time, showed none of the harmful consequences generally feared, and displayed greater resisting power against the disease, as manifested in some comparative series by a difference in mortality of two per cent. in favor of liberal feeding.

Dr. Nichols's paper on the general subject of typhoid dietetics was published in AMERICAN MEDICINE, May 6, 1905, IX, pp. 726-736.

He has also made a study of the historical development and basis of present dietetic methods in this disease (published in the MEDICAL RECORD July 29, 1905, LXVIII, pp. 171-174). He believes that the present methods have developed in a fortuitous and empirical way; have not been based on or subjected to the critique of modern physiologic and dietetic principles; and that there is involved in the present prevalent doctrine a surviving vestige of the ideas that characterized the exploded ancient theory and practice of antiphlogistic therapy.

In the AMERICAN JOURNAL OF THE MEDICAL SCIENCES for July, 1905, CXXX, 120-125, Dr. Nichols gives the first detailed report of a case of protozoa in the stomach occurring in this country. He found only twenty-two other cases of the kind on record, a study of which shows that this condition is to be regarded as a probable evidence of non-obstructive carcinoma of the stomach.

Dr. Nichols has also prosecuted some statistical studies of the relative proportions of the sexes at birth. In a paper published in the AMERICAN ANTHROPOLOGIST, 1905, VII, pp. 24-36, he gives the statistics of the num-

The AMERICAN JOURNAL OF SURGERY says:

"This volume forms the first of a series of three, which respectively will cover the subject of gynecology, obstetrics and pediatrics. Unlike most collaborations, it shows neither repetitions nor omissions, and the exposition throughout is uniform and smooth. The aim of the book is eminently practical, but quite sufficient regard has been accorded to theory, pathology and bacteriology. * * * * * * * * * * * * * * The seven contributors have succeeded in presenting a volume of sterling worth, well balanced, concise and instructive. The illustrations, with very few exceptions, are of the first order, and in most instances are original. The plates showing the successive steps of important operations elucidate the technic more plainly and more instructively than can many pages of text. The typography and the general appearance of the book leave nothing to be desired."

The JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION says:

"Within the limits set by the editor the work is, as a whole, interesting and commendable and in its execution a credit to the publishers. Because of its practical, as well as its scientific, character, it should prove a popular text-book for students and a valuable, concise hand-book for the general practitioner."

Dr. James Carroll, Professor of Bacteriology and Pathology will contribute the article upon "Yellow Fever," to appear in Volume 2, of "*Modern Medicine,*" a monumental work in seven octavo volumes of 900 pages each to be edited by Dr. William Osler and published by Lea Brothers. The prospectus has just been issued. The various subjects are treated by eminent American, British and Continental authors. Dr. Carroll also contributed the section on "Gelbfieber" (Yellow Fever,) in the "Handbuch der Tropenkrankheiten;" a work in three octavo volumes, edited by Dr. C. Mense, of Kassel, and published in Leipsic, 1905. It is an exhaustive presentation of our present knowledge of tropical diseases. It has recently been translated from German into Italian. Dr. Carroll's relation to yellow fever investigations is ably treated in Dr. Donnally's paper in this number.

Dr. Francis R. Hagner, Clinical Professor of Genito-Urinary Surgery and Venereal Diseases, had a paper in the *American Record* of October, on "Operative Treatment of Acute Gonorrheal Epididymitis;" also one on "Tuberculosis of the Bladder and a plea for early diagnosis," in the *Virginia Medical Semi-Monthly,* August 10, 1906.

Dr. J. B. Nichols, Professor of Histology, has made a study of the subject of feeding in typhoid fever, as the result of which he disagrees with the generally accepted plan of a practically exclusive milk or so-called "liquid" diet and advocates the employment of a more liberal and varied diet than that in general use.

On the basis of published metabolism and digestion studies in actual cases, he has endeavored to work out the theory or principles of typhoid dietetics on the same basis and the same kind of data as have served for the scientific establishment of the recognized principles underlying dietetics in health and infant feeding. By these methods he has determined a standard for feeding typhoid fever patients (2,000 calories of energy and 100 grams of proteid daily) that may be accepted tentatively until further investigations directly to this end may fix it definitely. Digestion experiments were found to show that, contrary to the prevailing belief, the digestive powers in typhoid fever are on the average lowered only five to ten per cent. Consideration of other factors seemed to show that the present fears and objections to soft and solid food are unfounded, and that a mixed diet really is less objectionable than the "liquid" diet now in use.

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Dr. Nichols has also prosecuted some statistical studies of the relative proportions of the sexes at birth. In a paper published in the AMERICAN ANTHROPOLOGIST, 1905, VII, pp. 24-36, he gives the statistics of the numbers of sons and daughters in 3,000 families of six or more children each, from which it appears that the actual distribution of the sexes corresponds with practical exactness to what would be expected from the operation of the laws of chance.

In another study (not yet published) he has collected the statistics of over 700,000,000 births, from which are gathered the relative numbers of males to females born, in living births, stillbirths, and multiple births, in the different countries, among various races, and in connection with such conditions as legitimacy, etc.

The students of the medical department, by the courteous invitation of the Medical Society of the District of Columbia, were given the privilege of listening to the address of Sir Almroth E. Wright, M.D., F.R.S., late Professor of Pathology, Army Medical School, Netley, and at present Pathologist to St. Mary's Hospital, London, before that body on October 12, 1906, at a special meeting called for the purpose.

Dr. Wright's subject was, "Principles of the Treatment of Bacterial Diseases by the Inoculation of Corresponding Vaccines," and for one hour he held the undivided attention of the large number assembled to hear him. In the first part of his discourse he showed that the two plans pursued by the medical profession up to the present time in the treatment of bacterial infections, namely, (1) the use of strong medicines, and later (2) the expectant plan with rest, hygiene, diet and such stimulation as might be needed to keep the heart going, were wrong in principle according to our present knowledge, and were destined never to reach such cases as the ten per cent. of typhoid patients nor the ninety per cent. of plague patients who die, nor the strong man laid by for a year or two in an attack of Malta fever, nor those patients with localized infections such as bone and joint tuberculosis, uterine discharges, lupus, acne, furunculosis and so on. He illustrated further at some length the inefficiency of the present expectant treatment and of local treatment with antiseptics.

Proceeding, he showed that it was within our power to take advantage of the immunizing apparatus with which the animal ecomony is equipped, by inoculation of dead cultures of the infecting bacterium and thus increase the power of resistance of the individual to the invader so that the disease may be overcome. The application of this procedure offers many obstacles to its successful practice. Although Dr. Wright omitted discussion of technique, the major portion of his address was devoted to explaining the effect of these inoculations and the resultant reaction of the individual. He pointed out the necessity of frequent, tedious blood examinations to determine the opsonic index and from this the suitable time for administration, as essential to the intelligent employment of the method.

"Opsonins" are chemical substances in blood serum which sensitize bacteria so that the leucocytes will engulf and destroy them (bacterial phagocytosis). In normal individuals the opsonic power of the blood varies within exceedingly small limits, and the average number ingested by the normal leucocyte is used as a standard and called one. In infections the leucocytic phagocytosis usually differs from the normal, being greater or less, the ratio to the normal phagocytosis expressed numerically is called the "'opsonic index." A high opsonic index is always more than one; a low opsonic index less than one. Without the knowledge of the effect of the inoculations, harm rather than good is likely to result. Schematic charts were used to elucidate the theory, and charts of actual cases in which Dr. Wright had employed it.

This led to the last part of the address, in which Dr. Wright told of some of his remarkable results. A case which seemed to appeal to his audience more than others was one of "infective endocarditis" in a young woman, secondary to a severe angina, which was regarded by the physicians and surgeons in attendance as hopeless. Both sides of the heart were involved. For weeks she ran an exceedingly high temperature, and the end seemed only a question of a short time. Dr. Wright was called in at this juncture. His first move was to make a blood culture, which resulted in the isolation of a streptococcus from the circulating blood. Then he determined the opsonic index of her blood for this organism. Material for injection was prepared with this bacterium also. Her first inoculation was 5,000,000 dead streptococci of the strain isolated from her blood. By similar inoculations with frequent determinations of opsonic index to guide him, the young woman got well and is living to-day.

Other cases described, showing brilliant results, were pulmonary and joint tuberculosis, lupus, empyema, gonorrheal arthritis, sycosis, acne and chronic furunculosis.

Dr. Wright is a fluent, easy speaker, and such a master of his theme that this complex subject seemed simple as he logically and rapidly unfolded it.

UNIVERSITY APPOINTMENTS.

Beginning with the Academic Year, 1906-07.

Acting Dean of the Department of Politics and Diplomacy, November 1, 1906: CHARLES WILLIAM AUGUSTUS VEDITZ, Ph. D.

Ph.B., University of Pennsylvania, 1891; Graduate courses in Economics and Public Law (in Germany), 1891-'95; Halle University, 1891-'93; Berlin, 1893-'94; Leipzig, 1894-'95; Ph.D., (1895), Halle University; Studies in France in Sociology, History and Public Law, Ecole de Droit, 1896-'99 (licencié en droit); Ecole des Hautes Etudes, 1896-'97; Ecole d'Anthropologie, 1896-'98; Sarbonne, 1897-'98; Collège de France, 1898-'00; Collège libre des Sciences Politiques, 1898-'99; Collège libre des Sciences Sociales, 1898-1900. Fellow in Sociology, University of Pennsylvania, 1901; Professor of Economics and History, Bates College, Lewiston, Maine, 1901-'04. Lecturer on Sociology, Bangor Theological Seminary (Maine), 1904-'05; General Secretary and Staff Lecturer, University Extension Society of Maine, 1903-'05; Secretary American Sociological Society, 1906; Editor-in-Chief, Bulletin of the American Economic Association, 1906; Member, American Economic Association, American Academy of Social and Political Science, Council of National Economic League, American Sociological Society, Institute International de Sociologie, Internationale Vereinigung für vergleichende Rechtswissenschaft, etc. Professor of Economics, the George Washington University, 1905.—

DEPARTMENT OF ARTS AND SCIENCES.

COLUMBIAN COLLEGE.

Professor of Botany: ALBERT MANN, Ph. D.

Ed., Wesleyan University; B.A., ibid, 1879; M.A., ibid, 1882; student in University of Munich, 1892-1894; Ph.D., ibid, 1894; research work, ibid. 1900-1901; Professor of Botany, Ohio Wesleyan Univ., 1895-1900. Expert, Department of Agriculture, stationed at Washington, D. C., 1906.

Librarian of the Department of Arts and Sciences and Assistant Professor of German: ALFRED F. W. SCHMIDT, A.M.

Ed., Mt. Angel College, Oregon, 1889-'91; A.B., Leland Stanford, Jr., University, 1895; A.M., honoris causa, Mt. Angel College, 1900; Asst. in the University Library, Leland Stanford, 1894-'97; Assistant and Instructor in Anglo-Saxon, ibid., 1896-'97; Instructor in German, ibid., 1897-1900; Head Classifier, University Library, ibid., 1900-'01; Assistant Librarian, ibid., 1901; Asst. in Classification Catalogue Division, Library of Congress, 1902-'06; Instructor in German, The George Washington University, 1905-'06.

Assistant Professor of Mathematics: PAUL NOBLE PECK, A.M.

Ed., Emerson Institute, Washington, 1890-'98; A.B., The George Washington University, 1904; A.M., ibid., 1905; Principal, Paducah Preparatory School, 1902-'03; Assistant in Greek and Latin, The George Washington University, 1904-'05; Instructor in Mathematics, ibid, 1905-'06.

Assistant Professor of English: T. DEWITT CROISSANT, A.B.

Student, Columbian College, 1895-'97; A.B., Princeton University, 1899; Graduate Student, University of Chicago, 1899-'01; Instructor in English, University of Colorado, 1901-'02; Fellow, Princeton University, 1902-'03; Student, University of Munich, 1903-'04; Instructor in English, The George Washington University, 1905-06.

Instructor in History: JAMES FREDERICK PEAKE, A.M.

A.B., Randolph-Macon College, 1902; A.M., The George Washington University, 1904; Instructor in Greek, Randolph-Macon College, 1901-'02; Teacher of Latin and English, Randolph-Macon Academy, 1902-'03; Assistant in English, The George Washington University, 1904-'05.

Adviser of Women and Instructor in English: HARRIETT STRATTON ELLIS, A.B.

A.B., Woman's College, of Baltimore, 1892.

Instructor in Chemistry: WALTER OTHEMAN SNELLING, M.S.

B.S., The George Washington University, 1904; B.S., Harvard, 1905; M.S., Yale, 1906.

Instructor in Mathematics: GEORGE ALBERT ROSS, A.M.

A.B., William Jewell College, 1893; A.M., The George Washington University, 1898.

WASHINGTON COLLEGE OF ENGINEERING.

Instructor in Civil Engineering: OSCAR A. MECHLIN, C.E.

B.S., Dartmouth College, 1903; C.E., The George Washington University, 1906; Assistant Engineer, District of Columbia, 1904-'06.

Instructor in Mechanical Engineering: A. C. WILLARD, B.S.

B.S., Massachusetts Institute of Technology, 1904; Principal, University School, San Francisco, 1904-'06.

Instructor in Physics and Electricity: EVERETT W. VARNEY, A.B.

A.B., Bowdoin College, 1899; Assistant in Physics, ibid, 1898-'9.

Instructor in Electrical Engineering: T. F. S. MAGUIRE, B.S.

B.S., Massachusetts Institute of Technology, 1897.

DEPARTMENT OF MEDICINE.

Professor of Nervous Diseases: CHARLES H. CLARK, M.D.

M.D., Starling Medical College, Columbus, Ohio, 1893; House Physician, St. Francis' Hospital, Columbus, Ohio, 1893-1894; First Assistant Physician, Ohio Hospital for Epileptics, Gallipolis, Ohio, 1894-1897. Second Assistant Physician, State Hospital for Insane, Columbus, Ohio, 1897-1898. First Assistant Physician, State Hospital for Insane, Massilon, Ohio, 1898-1899. Second Assistant Physician, Government Hospital for Insane, Washington, D. C., 1899-1906. Clinical Director, Government Hospital for Insane, Washington, D. C., since April 1, 1906.

Professor of Morbid Anatomy: Isaac Wright Blackburn, M.D.

M.D., University of Pennsylvania, 1882; Pathologist to Government Hospital for the Insane, since 1884; Lecturer on Pathology of Mental Diseases, The George Washington University, 1885-'86; Professor of Pathology, ibid, 1886; Professor of Pathology and Histology, ibid, 1889; Professor of Morbis Anatomy and Special Pathology, ibid, 1898;

Member of the American Medico-Psychological Association, Corresponding Member of the Philadelphia Pathological Society; Member of the American Association for the Advancement of Science, and other medical and scientific societies.

Professor of Physiology: Shepherd Ivory Franz, Ph.D.

A.B., Columbia University, 1894; Fellow, 1895-'99, and Ph.D., ibid, 1899; Assistant in Physiology, Harvard Medical School, 1899-1901; Instructor in Physiology, Dartmouth Medical College, 1901-'04; Pathological Physiologist, McLean Hospital, the Insane Department of Massachusetts General Hospital, 1904-'06; Research Assistant, Carnegie Institute of Washington.

DEPARTMENT OF LAW AND JURISPRUDENCE.

Professor of Law: Edward S. Thurston, A.M., LL.B.

A.B., Harvard University, 1898; A.M., ibid, 1900; LL.B., ibid, 1901; practised law in New York City, 1901-'06; Instructor in Law, Indiana State University, 1906.

Professor of Law: W. C. Dennis, A.M., LL.B.

A.B., Earlham College, Richmond, Ind., 1896; A.B., Harvard University, 1897; A.M., ibid, 1898; LL.B., ibid, 1901; Secretary, Lake Mohonk Conference on International Arbitration, 1901-'02; Instructor in School of Law, University of Illinois, 1902-'03; Assistant Professor of Law, ibid, 1903-'04; Assistant Professor of Law, Stanford University, 1904-'05; Adjunct Professor of Law, Columbia University, 1905-'06; Assistant Solicitor, Department of State, 1906.

UNIVERSITY MISCELLANEA.

At the celebration of the hundredth anniversary of the founding of the University of Aberdeen, the degree of LL.D. was conferred upon Professor Frank Wigglesworth Clarke, Professor of Mineral Chemistry in the Faculty of Graduate Studies.

Professor Charles E. Munroe has been appointed superintendent of the special alcohol exhibit of the Jamestown Exposition. This appointment was made in recognition of Professor Munroe's standing as a chemical expert.

Professors Yarrow, Carroll, Bovée and Ruffin attended the meeting of the British Medical Association in Toronto last August.

Dr. Yarrow, Professor of Dermatology, was official representative of the University at the opening of the new Harvard Medical School Buildings September 26. Dr. A. F. A. King, Professor of Obstetrics, also was present as the official representative of the University of Vermont.

Dr. George N. Acker, Professor of Pediatrics, delivered the president's address before the Washington Gynecological Society October 5, 1906. His subject was "The Etiology and Treatment of Nervousness in Infancy and Childhood." Dr. Acker was made a member of the Council of the Pediatric Society in May, 1906.

Professor James Brown Scott has issued a prospectus announcing the forthcoming American Case-Book Series, which is to contain collections of cases on thirty of the principal topics now taught in American law schools. These collections of cases are to be prepared by teachers in the different law schools of the country, under the general editorial supervision of Professor Scott. The series will be published by the West Publishing Company, of St Paul, Minnesota.

Professor Scott, who was last March appointed Solicitor of the Department of State, is also to be editor of the American Journal of International Law, the publication of the recently established American Society of International Law. The first number is expected to appear in January.

At the recent meeting of the Association of American Law Schools, held at St. Paul, Minnesota, August 28-30, Professor William R. Vance, Dean of the Department of Law and Jurisprudence, was elected Secretary of the Association for the ensuing year.

Partly in recognition of his services in organizing the American Sociological Society, Professor C. W. A. Veditz, Acting-Dean of the Department of Politics and Diplomacy, has recently been elected a member of the International Institute of Sociology, an honorary organization with narrowly limited membership. Only seven Americans enjoy the distinction, among them Lester F. Ward, Franklin W. Giddings, Carroll D. Wright and Albion W. Small.

At the recent annual meeting of the Medical Society of Virginia, Doctor Bathurst Brown Bagby, '04, read a paper on uncinariasis, or hookworm disease, in Virginia. He presented several patients so affected. Dr. Bagby's cases are the first recognized in the medical history of the state. The appreciation of Dr. Bagby's original contribution was recognized by his election as first vice-president of the Society for 1907. This is an honor never before conferred on so young a member.

The first Fall Convocation of the George Washington University was held on Wednesday, the 17th inst., in Memorial Continental Hall. The purpose of this convocation is to bring together the new and old students of the University and to afford an opportunity for the conferring of degrees upon students who have completed the requirements, but who were prevented from taking part in the regular commencement exercises. The speaker on this occasion was Dr. Carl Beck, Professor of Surgery in the Postgraduate Medical School, University of the State of New York, and President of St. Mark's Hospital, of New York. The subject of his address was, "The Influence of American Medicine and Surgery on Europe," which we take pleasure in publishing in this issue. Dr. M. Ross Fishburn, Pastor of the Mt. Pleasant Congregational Church, acted as Chaplain of this occasion. Degrees were conferred on a number of candidates and debate medals were awarded to successful contestants of the last session.

The *University Hatchet*, our weekly newspaper, is now strictly under student control, as the financial interest in the publication held by individuals has been bought, and the ownership is now vested in a corporation known as "The University Hatchet." The corporation consists of five students and two professors appointed for the first session by the President of the University, namely: Messrs. Wilson, Gates, Call, Moore and Russell, and Professors Carroll and Vance. At a meeting held in June the Board of Editors elected Mr. Robert I. Moore, Editor-in-Chief and Mr. Arthur J. Russell, Business Manager for 1906-'07. Mr. E. P. Gates is Chairman of the Board.

The University Library has been enlarged during the summer both in quarters and in equipment. The entire north end of the first floor, with the exception of the President's office, has been remodelled and adapted to library purposes. The Germanic library of the late Professor Richard Heinzel, of the University of Berlin, which was purchased by the University last spring, has been received and installed on the library shelves. This library contains 7,200 volumes and pamphlets bearing on German philology and literature and a large number of works and periodicals in cognate branches, especially Anglo-Saxon, Old English, Romance and Slavic languages. Dr. A. F. W. Schmidt, formerly of the Stanford University library staff and of the Library of Congress, recently appointed Librarian, is now engaged in making a catalogue of this important collection of books.

At the annual meeting of The George Washington University Medical Society held in May, 1906, the following officers were elected for the present year: President, Dr. J. W. Chappell, '81; Vice-President, Dr. H. T. A. Lemon, '96; Secretary, Dr. D. W. Prentiss, '99; Treasurer, Dr. L. H. Taylor, '03; Council, Drs. A. Barnes Hooe, '06, H. C. Yarrow, J. Lewis Riggles, '00, T. V. McLaughlin, '82, Thomas A. Groover, '98. The initial meeting of this session was held on Saturday evening, October 20th, in the Medical Building. Dr. Chappell, the President, was in the chair and about eighty members were present. After a brief address by President Needham, the principal paper of the evening was read by Dr. Medford, on "Tetanus: Report of a Case with Recovery," which elicited considerable discussion. Dr. Carr exhibited a bone drill and a bone saw of his own invention. Dr. White presented a brief note on the application of a plaster cast to an open wound. After adjournment the members enjoyed an informal smoker.

The energy and enthusiasm of the University Medical Society is a source of gratification to the whole University. Organized just one year ago with Dr. Hooe as President, it has grown in interest and effectiveness until it now numbers one hundred and twenty members. The majority of the papers presented in this issue of the Bulletin were read before the Society.

The academic year began in Columbian College with a schedule of 219 class and laboratory periods each week. The following appointments have been made on the Faculty:

Albert Mann, Ph.D., Professor of Botany; Alfred F. W. Schmidt, A.M., Assistant Professor of German, and Librarian of the Library of Arts and Sciences; James Frederick Peake, A.M., Instructor in History; Walter Otheman Snelling, M.S., Instructor in Chemistry; Harriett Stratton Ellis, A.B., Adviser of Women and Instructor in English; George A. Ross, A.M., Instructor in Mathematics.

Very important in the College work is the appointment of Miss Ellis as Adviser of Women. She is a graduate of the Woman's College of

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devote their whole time to the study of law and those whose employment in the Government service or elsewhere precludes their attendance upon any lectures until the late afternoon. Heretofore the program of work arranged for candidates for the degree of Bachelor of Laws was so ordered that all of the lectures required for that degree could be taken after 4:30 P. M. and within the three years set by the Association of American Law Schools as the minimum time requirement for candidates for this degree. Experience proved what might have been easily expected; that those students whose employment outside the University consumed a greater part of the time were unable to carry successfully the amount of work that, under modern standards, is reasonably required for the degree of Bachelor of Laws. Therefore, in order to secure to this class of students, which has always been numerous in Washington, the advantages of a sound and thorough training in the law, it was decided to permit them to take only three-fourths of the work required each year of the students devoting their whole time to their legal studies. This end is accomplished by giving in the afternoon only nine of the twelve hours of work required each year. Six hours of the lectures for each year will be given in the forenoon. By altering the subjects given in the forenoon and afternoon respectively, students who can attend only afternoon classes will be enabled in four years to complete the amount of work required for the degree.

This change puts this department on a basis of full day work, and will enable the Faculty to fix the standard of work, both as to extent and as to thoroughness, at a level equal to that now maintained by the leading law schools of the country.

The so-called "case method" of law teaching grows in favor, both with the members of the Faculty and with the student body. Collections of cases are now used as the basis of instruction in most of the subjects taught.

The graduate courses offered to students who are candidates for the degree of Master of Laws have been greatly extended, and increased by the addition of courses in Taxation, Extraordinary Legal Remedies, Railway Law, Brief Making, Spanish-American Law and Mortgages. In addition to these, Professor Scott is conducting a weekly seminary in International Law. These graduate courses are intended chiefly to meet the needs of the increasing body of students who come to Washington after graduation in law from the various State universities with the purpose of taking advanced work in law in this University.

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The George Washington University Bulletin is published four times a year, under the editorial supervision of the Board of University Publications, appointed by the President's Council. It is the purpose of the Council to make the Bulletin an organ of the educational and scientific activities of the University. The University Catalogue constitutes one number. Others are devoted to information of special interest to the Alumni and patrons of the University. Scientific numbers are published from time to time containing contributions from instructors and graduates and information regarding books, monographs and papers published by them under other auspices.

The present scientific number is devoted to the Faculty of Graduate Studies and especially to the departments of natural and physical science. A number of papers from members of the faculty and abstracts of theses accepted for higher degrees are presented. It contains also: The second annual Supplement to the University Bibliography published Sept. 1, 1904, being a record of works and papers published since Oct. 1, 1905, by members of the faculty and Ph.D. graduates; notes bearing on investigations and researches made by instructors in this department; announcements of recent appointments, and miscellaneous items of University interest. The Board desires to be kept informed as to the academic record, publications and professional appointments of instructors and graduates in all departments of the University. Communications may be addressed to the Director.

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The George Washington University
BULLETIN

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THE REMARKABLE STORY OF A GREEK FISH, THE GLANIS.*

By Theodore Gill, M.D., Ph.D., LL.D., etc., Professor of Zoology.

Among the most characteristic types of North American fishes is the group of Ictalurines, whose members are chiefly known as catfishes, These are smooth-skinned forms with the anus about midways between the snout and caudal fin, or nearer the latter, the head furnished with eight barbels, the back with a well-developed spinigerous fin as well as an adipose, and the anal fin moderately long. There are many species and those best known have long been celebrated for the care one of the parents takes of the eggs and young.

A type equally characteristic of central and northern, and still more of eastern Europe, is that best known in Germany as the Wels and in Russia as the Som; *Silurus glanis* is the scientific name. It is also a smooth-skinned fish but the anus is very much nearer the head than the caudal fin and consequently the tail is very long; the head is furnished with only six barbels, the nasal pair being absent; the back has a small contracted fin with a very weak spine and there is no adipose fin; the anal fin is extremely elongated. Unlike the North American catfishes, the species exercises no care of either the eggs or young, the female merely "scooping with her tail a hole" in which she deposits her eggs and she, as well as the male, after fertilizing them leaves them without further care.

From time immemorial the fishermen of northern Greece have known a fish which, in olden days they called *Glanis* and which they still designate by names of the same origin. Many detached data were recorded about its habits and characteristics by Aristotle. When ichthyology had been given the general framework it now has, and the fishes of northern Europe had become better known than those of southeastern, the *Glanis* was unhesitatingly identified with the Wels, and *Silurus glanis* was the name given to the fish of the north in token of that assumed identity.

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*The University is indebted to the Smithsonian Institution for the use of the figures illustrative of this article; they were prepared for an article on "Parental Care Among Fresh-water Fishes," by Prof. Gill, to be published in the Smithsonian Report for 1905. The figures are made from one of the type specimens presented by the Museum of Comparative Zoology to the U. S. National Museum. The other specimens and especial types are still retained by the Museum of Comparative Zoology.

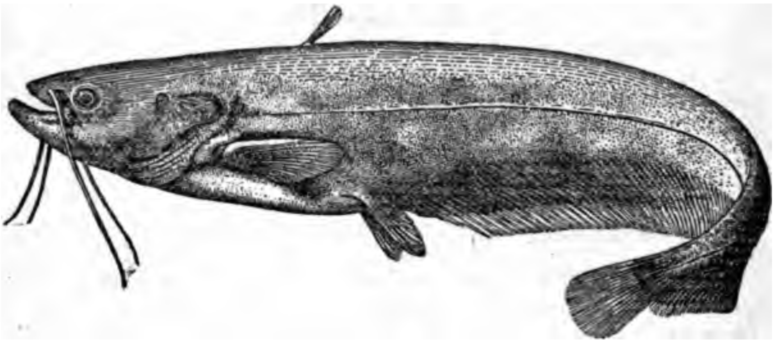

Fig. 1.—The Glanis (Parasilurus Aristotelis).

The fullest information we possess, up to the present time, respecting the habits of the Grecian fish was that furnished by Aristotle in his History of Animals. This, however, was not in a continuous form as in modern works, but scattered through a number of "books" and chapters treating of different structures, parts, and functions. These items are of sufficient interest and importance to merit reproduction here. The chief passages are given in the form of translations from the Greek by Professor Louis Agassiz, who doubtless enjoyed the advantage of co-operation of his friend, Professor Cornelius C. Felton, a renowned Greek scholar,* and finally president of Harvard University, who helped to procure his specimens. For the shorter passages the present writer is responsible. This summary will give a good idea of Aristotle's treatment of zoological matters.

In a chapter (I, 5, 3)† on the members and movements of animals, there is an incidental allusion to the *Glanis,* implying that it was familiar enough to serve as a term for comparison. The Kordylos [a Salamander], it is stated, "swims with both its feet and tail, and (to compare small things with great) it has a tail like the *Glanis.*"

In a chapter (II, 9, 4) on the characteristics, and especially the branchiæ of fishes, it is stated that some "have four branchiæ, all divided except the last, as the Kichle [Wrasse], Perke [Perch], *Glanis*, and Kuprinos [Carp]."

---

*Felton's "Greece, ancient and modern," in two volumes, 1867, is still one of the best and most interesting works on Greek life.

†The three figures within parentheses indicate the book (I. etc.), the chapter (5, etc.), and the section of the chapter (3, etc.), of the History of Animals.

A chapter (II, 11, 7) is devoted to the internal parts of sanguineous or vertebrate animals and, in a section (7) on the gall-bladder, it is said that in some fishes "the gall is placed upon the liver, as in the Galeodes [ordinary sharks], the *Glanis*, the Rhine [Angel-fish], the Leiobatos [skate], the Narke [torpedo], and in some long fish, as the Enchelys [eel], the Belone [pipe-fish], and the Zugaina [hammerhead shark]."

In the sixth book (VI, 13, 2 to 4) the manner of spawning is described as follows:

> "The fresh-water fishes spawn in the still waters of rivers and lakes among the reeds, as the Phoxinos [minnow] and the Perke [yellow perch]. The *Glanis* and the Perke give out their spawn in a continuous string, like the frogs; and, indeed, the spawn is so wound up that the fishermen reel it off, at least that of the Perke, from the reeds in lakes.
>
> The larger *Glanis* spawns in deep waters, some at the depth of a fathom; the smaller in shallower places, especially among the roots of willows or some other tree, and also among the reeds, or the mosses.
>
> They copulate, sometimes a very large with a very small one, and bringing the parts together which some call the navel, and through which they discharge the seed, the females the eggs and the males the sperma. All the eggs that are mingled with the sperma become generally on the first day white and larger, and a little later the eyes of the fishes become visible. These at first, in all fishes as also in other animals, are early conspicuous on account of their size. And those of the eggs that the sperma does not touch, as in the case of sea fishes, are useless and sterile.
>
> But in these fertile eggs, as the fishes grow larger, a kind of husk separates. And this is the envelope that incloses the egg and the young fish. When the sperm has mingled with the egg, the spawn becomes more viscous among the roots, or wherever it may have been deposited. And where the greatest quantity is deposited, the male guards the eggs and the female, having spawned, departs. The growth of the *Glanis* from the egg is very slow, wherefore the male keeps watch forty or fifty days, that the young may not be devoured by the fishes that happen to be in their neighborhood."

Aristotle incidentally adds, in subsequent paragraphs, that "the eggs of the *Glanis* become as large as the seed of the orobos" (S. 5)—that is, the millet—and that none of the fresh-water fishes "except the *Glanis* watch their eggs" (S. 6).

How the eggs are taken care of after spawning, and later the young, is told in a subsequent book (IX, 25, 6):

"Of the river fishes, the male *Glanis* takes great care of its young. For the female, having brought forth, departs, but the male, where the greatest deposit of eggs has been formed, remains by them watching, rendering no other service except keeping off other fishes from destroying the young He does this for forty or fifty days, until the young are sufficiently grown to escape from the other fishes. And he is known to the fishermen whereever he may chance to be watching his eggs; for he keeps off the fishes by rushing movements and by making a noise and moaning. And he remains by the eggs with so much of natural affection that the fishermen, when the eggs adhere to deep roots, bring them up to the shallowest plac they can; but he does not even then leave his offspring, but if he chan to be a young fish, he is easily taken by the hook, because he snaps at a the fishes that approach him; but if he is already accustomed to this, an has swallowed hooks before, he does not even then desert his young, b breaks the hook by a very strong bite."

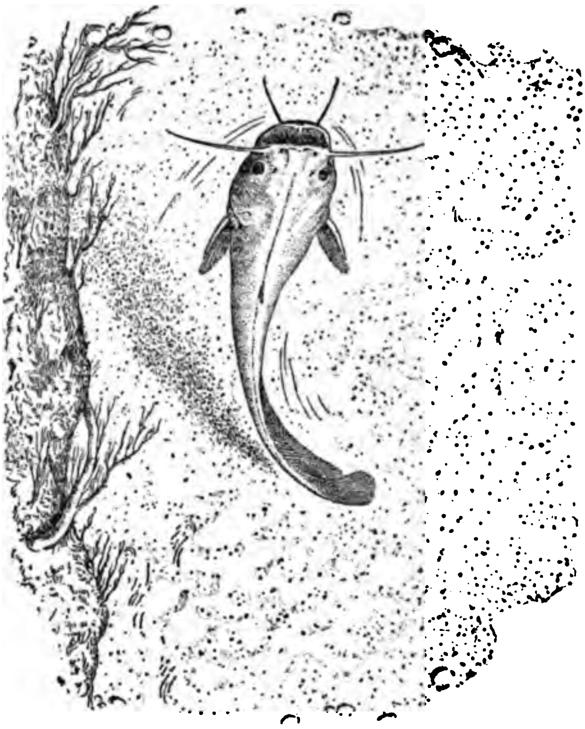

Fig. 2.—Nest of the Glanis (Ideal).

The hooks so easily broken must have been very different from those of our days!

In a chapter (VIII, 20, 12) on the agencies affecting the health of animals, the *Glanis* is also mentioned in the paragraph thus translated by Agassiz:

"The river and lake fishes are exempt from pestilential diseases, but some of them have peculiar disorders, as the *Glanis*, which, about the time of the dog star, by reason of swimming on the surface, becomes sunstruck, and is stupefied by loud thunder, and many *Glanides* in shallow water perish by the bite of [water] snakes."[*]

One passage relative to the *Glanis* (VIII, 29, 5) has been overlooked by Agassiz and is here translated from the original Greek.

"River and pond fishes are best after spawning and milting, when they have recovered their bodily vigor. Some are good during the spawning season, as the Saperdis; others bad, as the *Glanis*. The males of almost all species are better than the females, but the female *Glanis* is better than the male."

Such was the first original account of the Grecian Glanis as well as the last for very many years. The various later references to it were merely incidental or based on Aristotle. Indeed, about twenty-two centuries were destined to elapse before anything more was known of the fish. Meanwhile, the account became discredited and the species was regarded as identical with the Wels of the north.

In 1839, two of the greatest ichthyologists of the last century, Cuvier and Valenciennes,[†] regarded this account with great skepticism and recapitulate it, concluding with this opinion:

"What Aristotle relates in detail, and in two passages, of the care which the male Silurus takes of the eggs of his female, borders a little on the marvelous. According to him, the large Siluri deposit them in deep waters; the smaller among the roots of willows and other trees, among the reeds or even the mosses. The female, having laid them, leaves them, but the male guards and defends them, and, *as these eggs are long in hatching,* he continues this care forty or fifty days."

This skepticism was not all unnatural in view of the fact that the French naturalists thought there was no doubt that the Aristotelian fish was specifically identical with the *Silurus glanis* of central Europe; "On ne peut douter que notre silure ne soit le Γλάνις d'Aristote," they exclaimed (p. 344). This opinion was confirmed, they thought, by the fact that the Silurus is called at the present day *Glanos* or *Glano* in Turkey. Fifty-six years later (1895) another eminent European ichthyologist (Prof. F. A. Smitt) declared that "the ancient account of Aristotle, that the male hatches the roe, is now regarded as dubious."

---

[*] A curious version of this passage was made by R. Creswell in his translation of the History of Animals. "* * * the Glanis, from its swimming near the surface, appears to be star-struck by the dog star and it is stupified by loud thunder * * * The Glanis, in shallow water, is often destroyed by the dragon-serpent."

[†] Histoire Naturelle des Poissons, t. 14, pp. 350, 351

It may be now recalled that the *Silurus glanis* does not care for its eggs but, after depositing and fecundating them, the parents leave them to Dame Nature. The skepticism of naturalists respecting the statements of Aristotle was then quite natural as long as there was supposed to be no structural difference between the common Silurus and the Glanis of the Achelous.

From the fourth century before the Christian era a leap may be made to the latter half of the nineteenth and into a new world.

America is not inhabited by any species of the same group or even subfamily as the Glanis, but, as already indicated, has numerous representatives of the same family and of a subfamily quite closely related to the Silurines. Species are found almost everywhere in the streams and lakes of eastern America and the valley of the Mississippi, and are generally known as catfishes. It was also long known that some at least exercised care of their eggs and young. It was therefore quite natural that one familiar with the Wels in Europe as well as with the catfishes of America, Prof. Louis Agassiz, should accept with implicit faith the account of the ancient naturalist, and at the same time be skeptical as to the correctness of the identification of the Grecian fish with that which he had well known in central Europe. In 1856 that naturalist received specimens of a Silurid from the same river (Achelous) from which Aristotle had secured his Glanis, and these were evidently of the same kind as that described by the old naturalist. The specimens, on comparison with some of the Wels, were found to be quite different, the species was named *Glanis Aristotelis*, and an interesting account of them, in the form of translations from Aristotle, was presented to the American Academy of Arts and Sciences and published in their "Proceedings" (III, pp. 325-334).

In this long account, however, no indication was given of any structural differences between the Grecian and German fishes, and consequently for half a century the species has been ignored by European naturalists. Indeed, in the latest English work on fishes (The Cambridge Natural History, Vol. VII, p. 593, 1904) the great ichthyologist, Dr. George Boulenger, expressly affirms that the "only European representative of the family" Siluridæ is the *Silurus glanis*. Nevertheless, in 1890, in response to the present writer's demand for information,* Samuel E. Garman published a description of the specimens collected and commented on in 1856, and called the species *"Silurus (Parasilurus) Aristotelis."* It appeared that "from the young of *S. glanis* L. of equal length, they are readily distinguished by the possession of four barbels instead of six," as well as "by the difference in shape of those on the maxillaries—they being shorter, less compressed, and more threadlike, by the wide separation in the middle of the band of vomerine teeth, by a larger eye, by a greater slope to the sides of the head, by a smaller dorsal, by the smaller number of rays in the anal, and by the markings." The largest of Mr. Garman's specimens was "less than 9 inches in length." All these characters the present writer has been able to confirm. Furthermore, the snout is more convex in front transversely than in the Wels, the chin barbels further from the symphysis than the foremost ones of the Wels, and the opercles are smaller and especially shorter.

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*A notice of "the Greek Catfish or Glanis" was published in "Forest and Stream" for October 2, 1890, recapitulating what had been written by Aristotle and Agassiz, and calling for further details.

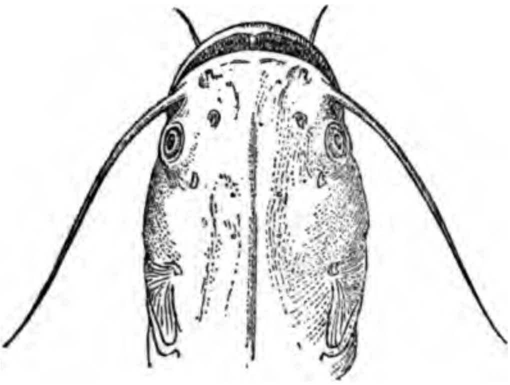

Fig. 3.—Upper view of head showing contour, barbels and large eyes.

Such characters evidently indicate specific differences from the central European fish. Had Agassiz only added to his account one word, *four-barbeled,* Felton would have been justified in his exclamation, made after the communication of Agassiz:

"It is a very, striking fact that the fish in question should, so many centuries after the death of Aristotle, have come from the Achelous across the Atlantic to this country, to furnish our associate with a commentary on the great philosopher, and to vindicate his accuracy as an observer against the criticism even of a Cuvier."

The single word "four-barbeled" would not only have demonstrated (accuracy being conceded) that the *Glanis* was distinct from the Wels, but would have suggested to the well-informed ichthyologist that its affinities might be with certain eastern species rather than with the northern. The *Glanis* is, indeed, but distantly related to the Wels of the north and is a near relative of several Asiatic species. It is, in fact, the offspring of a successful invasion from Persiawards and the Orient. Doubtless the renowned ichthyologist appreciated and intended to have made known these facts, but postponement only anticipated non-performance. Not only did no European ichthyologist take cognizance of Agassiz's communication but a Grecian ichthyologist (Nicolas Chr. Apostolides) who published several articles on Grecian fishes, did not recognize the *Glanis* as a distinct species. In a catalogue of the fishes of Greece,* Apostolides merely enumerates the "*Silurus Glanis*" with Grecian synonyms known to him—"Γλάνις d'Aristote, Vulg, Γλανός à Vrachori, Γουλιανός à Larisse, il abonde dans le Pénée."

In fact, the only authors who have enumerated the *Glanis* among Greek fishes as a distinct species are two Americans, Horace Addison Hoffman, now Professor of Greek in the University of Indiana, who visited Greece in 1890, and David Starr Jordan, President of Stanford University and the eminent ichthyologist; the former made a considerable collection of fishes while resident in Greece and the later identified them for "A Catalogue of the Fishes of Greece," published in 1892. In that catalogue (Proc. Acad. Nat. Sc. Phila., 1892, p. 241-242) the *Glanis* is named as the "*Parasilurus Aristotelis* (Agassiz)" and abstracts of the observations by Aristotle are added.

Well then may the history of the *Glanis* be declared to be unique in the annals of ichthyology. A more detailed account of its habits was given of it than of any other fish by the greatest of ancient scientific authors, but the fish itself was lost sight of or confounded with another for more than a score of centuries. Then it was reserved for a naturalist of a new world to attempt to revive it, and to a follower of his still living to establish it as a distinct species and to tell us what it really is, while in its own country it remains unknown as a peculiar species.†

The modifications of the ancient name *Glanis* are tolerably numerous. According to Apostolides *Glanos* is a common form (especially at Vrachoir) and Cuvier and Valenciennes had long before recorded that *Glanos* and *Glano* are still current in Turkey. Dr. Roeser, in 1856 the "first physician to their majesties, the King and Queen of Greece," sent "specimens labelled Γλανίδια (*Glanidia*)" from the Archelous and Prof. Felton, the famous Greek scholar and twentieth president of Harvard University, found that "the local name still preserved among the fishermen, in the same region in the north of Greece, is Γλανίδι, formed, according to numerous analogies, from the genitive Γλάνιδος; and the plural of Γλανίδι is Γλανίδια, the word employed in the catalogue accompanying the specimens" sent to Aggasiz. An additional modification, Γουλιάνός appears to prevail at Larissa, where it is abundant in the Penēus river, according to Apostolides (1883).

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*La Pêche en Grèce—Ichthyologic, Migrations, Engins et Manières de Pêche, Produits, Statistique et Legislation—Athènes, 1883, p. 31.

†One of the most desirable fields for investigation at the present day, so far as the fishes are concerned, is Greece. The only enumerations of its species are very superficial and even, it must be added, deficient in accuracy. Doubtless, by a thorough examination and careful gathering of vernacular names in connection with the fishes themselves, most of the species mentioned [illegible] Aristotle and other ancient writers might be properly determined. Hoffman and Jordan have made an excellent beginning but there is necessity for another investigator with more time and opportunities than Hoffman enjoyed.

Aristotle, as usual, did not indicate the habitat of the *Glanis*. The specimens sent to Agassiz were "caught in the Achelous, the chief river in Acarnania, from which locality," Agassiz assumes (p. 332), "Aristotle himself had derived his information about the *Glanis*." According to Apostolides and Hoffman[*] it is also "caught in the Penēus river and "at Vrachori." These places are now mostly known by other names. The Achelous is the Aspropotamo; the Penēus the Salamvria, and Lake Vrachori or Vrakhori is also called Agrinion and was the Teichonis of the ancients.

Now that attention is once more recalled to the *Glanis*, let us hope that it may be wrested still more from the obscurity in which it has been so long enveloped.

Lexicographers have been no more fortunate in the treatment of the word Glanis that naturalists with the fish. If any old edition of the great dictionary of Liddell, Scott and Drisler is consulted, Γλάνις will be found to be defined as "a kind of shad!" This dictionary, it will be remembered, is "based on the German work of Passow" and he probably[†] defined it as *eine Art Schaden* or *Schaiden*. This word does not mean Shad but is the South German name for the Wels. Pape defined Γλάνις as *eine Art Wels* and this is substantially correct.

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[*] Hoffman did not secure specimens.

[†] The original Passow's dictionary is not at hand.

RECENT PROGRESS IN ASTRONOMY.

By Edgar Frisby, M.A., Professor of Astronomy.

Notwithstanding the fact that Astronomy is the oldest of all the sciences, it will probably be not very far from the truth to assert that observational and theoretical astronomy in its higher development does not date back of the last century. We cannot ignore the fact that a great many advances were made before that time, but most of them were sporadic, accidental and isolated. There were undoubtedly many very great and successful astronomers in ancient and medieval times; we might mention such names as Copernicus, Tycho Brahe, Kepler and Galileo, but no very great advances could be made in solving the riddles of the universe, until its elementary laws were discovered by Newton; and even after his time it required more than a century of effort before these laws could be put into analytical form and developed. We owe our modern analysis to the genius of men like Laplace, who wrote his great work *"The Mecanique Celeste,"* about the beginning of the nineteenth century. It is true that he was preceded by men like Euler and Lagrange, and he undoubtedly owed a great deal to them, still he seems to have made a more complete and systematic presentation of the case than did any who had gone before him. Newton gave the law, Leibnitz, Des Cartes and others invented the methods and symbols used in modern analysis, and Laplace put everything into practical form for investigation and computation. Since his time there have been many workers who have extended and simplified his methods; among these may be mentioned Pontecoulant, Delaunay, Hansen, Le Verrier, Gylden, Poincaré and our own G. W. Hill, and it seems almost difficult to imagine that much more can be done in pure theoretical astronomy. The field is certainly inviting, but the problems are necessarily so intricate and difficult that it seems now, as if very little further advances could be made in this line, unless some very brilliant genius should invent a more powerful and simplified method of investigation than any that has been developed up to the present time.

Before the invention of the telescope by Galileo in 1610 very great progress in observational astronomy was not to be expected, but even after that, progress was very slow for a time. Galileo discovered the four satellites of Jupiter, and Saturn's rings soon after the invention of the telescope; Huyghens, in 1655 discovered Titan, the largest of Saturn's satellites, and Cassini discovered four others before 1700. Still with these exceptions, and a few comets, it can be stated that no discoveries were made in the solar system until the time of Herschel near the end of the eighteenth century, and at the beginning of the nineteenth, for he discovered Uranus in 1781, and two satellites of Saturn in 1789.

Not one of the smaller planets or asteroids as they are called was discovered until the nineteenth century. As a matter of fact, the first one of the group was discovered by Piazzi at Palermo on the first night of the century, January 1, 1801. It had been suspected for a long time that there was a planet between Mars and Jupiter which had hitherto escaped detection, and an association of twenty-four astronomers, mostly German, and of which Baron de Zach was the president, was organized to look for the missing planet, or as one of their number stated, the association was formed for the purpose of forcing this planet from the regions of analogy to the realms of space. They all failed, however, during a dozen years of search, and the first planet of this group was discovered by one who was not a member of the association. The distances of Mercury, Venus, Mars, Jupiter and Saturn from the sun seemed to conform to an empirical law first announced by Professor Bode, of Berlin, in 1772. It was found also that the new planet Uranus conformed to this law. There was, however, an exception to the law since there was a vacant place in the series between Mars and Jupiter. While this Association of Astronomers was looking for this supposed planet, Piazzi was observing for a catalogue of stars. No definite star charts had at this time been constructed so he observed a number of stars in the neighborhood of the ecliptic, and carefully computed their places on successive nights, and after this laborious method, he at last saw a star which he had not previously mapped. There was nothing to distinguish it in appearance from any other star, except the fact that it had not been previously observed. Its position was therefore observed during several successive nights whenever possible, until he was taken ill, and when he recovered, the planet had become lost in the neighborhood of the sun. It was then, that the celebrated mathematician Gauss undertook the problem of computing the orbit of a planet from three complete observations, or from four observations, two only of which were complete. This work was a entire success, enabling de Zach to rediscover this planet by the end of the year, and Olbers, independently, on the next evening, just one year after its first discovery by Piazzi. After many revisions and much labor Gauss finally published his great work *"Theoria Motus Corporum Celestium, Etc.,* in 1809. This work was a complete discussion of the problem in all its bearings, and will always be unique as a masterpiece leaving, in theory at least, nothing more to be desired. The new planet was named Ceres. Pallas was discovered in 1802; Juno in 1804, and Vesta in 1807; all of them lying in the path between Mars and Jupiter, and for nearly forty years afterwards it was supposed that these four were the only members of the group, Astrea, however, was discovered in 1845, and Hebe in 1847, since which time not a single year has elapsed without at least one new member being added to the list, until at the present time there are 633 definitely known and numbered, of which 569 have received names, and as there are many more whose orbits have not as yet been definitely determined, and as it is not absolutely known at present how many of these are really new ones, it can fairly be stated that there are in the neighborhood of seven hundred of these small bodies, all revolving around the sun between the orbits of Mars and Jupiter, their inclinations and eccentricities on the average being much greater than those of the larger planets. Eros, number 433, and one lately discovered, having by far the greatest eccentricities, will probably give the most accurate value of the solar parallax, from which the distance of the earth from the sun can be computed.

A great many of the Asteroids were discovered by comparing the positions of stars in the heavens with previously prepared charts in the neighborhood of the ecliptic. It was by this method that Watson of Ann Arbor, Peters, of Clinton, New York, Palisa, of Vienna, and Luther of Düsseldorf discovered so many.

During recent years, however, most of the new planets have been discovered by photography, principally by Charlois at Nice, and by Wolf at Heidelberg, who first applied this method in 1891. The photographic telescope is moved by clock work, so as to keep pace exactly with the stars, so that an exposure can be made for two or three hours if necessary, and the stars will all appear like black dots on the negative, while any object that has any motion independent of the stars will appear as a streak. Satellites of planets can also be found in this way, if the moving telescope is so adjusted as to keep pace with the apparent motion of the planet. There are several advantages in this method of observing, one being that the telescope does not get tired with a long continuous exposure as the human eye does. Another great advantage is that by the action of the ultra violet rays, to which the photographic plate is especially sensitive, objects can be reproduced on the plate which are invisible to the eye, consequently it often happens that objects which are too faint to be seen with a telescope by the visual rays are photographed and then seen when developed on the photographic plate.

It was stated some time ago that Wolf had never seen one of all the asteroids he had discovered. It some times happens that several of these trails are seen on the same plate, and of course old as well as new asteroids appear on the plates. On all the plates taken at Heidelberg, during the last five years, the ratio of new to old asteroids is about in the ratio of 10 to 27 or 28, and the number of new ones actually being discovered does not appear to diminish from year to year; at least twenty or thirty new ones seem to be discovered each year, and we do not know when it will end. A little over a century ago, the members of the distinguished Association of twenty-four Astronomers were diligently searching for an asteroid for a period of twelve years and failed entirely, now it often happens that several are found in a single night. Some years ago when there were only about 140 known I heard Professor Watson say he thought it impossible that more than 200 could be found. This shows that distinguished people may be mistaken when they begin to predict.

The next discovery of any note was that of the planet Neptune by Galle of Berlin, in 1846. It had been noted that the orbit of the planet Uranus could not be reconciled with previous observations made before its recognition as a planet by Herschel, and that the most refined calculations were insufficient to account for its motion. In addition to that, its more recent motions could not be adequately accounted for, when the perturbations by Jupiter and Saturn were taken into account. As the theory of their motions and their masses had been pretty well determined, Le Verrier at Paris, and Adams at Cambridge, almost simultaneously and without the knowledge of each other, and by entirely different methods tried to solve the following problem: "Given the deviations from the computed and observed positions of a planet at different times, to find the mass, distance, and all the elements of the disturbing planet." It was evidently a very difficult problem; the use of a great many observations being necessary, the residuals or differences between the computed and observed positions being the known quantities and all the elements of the disturbing body entering as unknown quantities into a series of complex equations almost unmanageable. Both workers however, assumed that its distance was in accordance with Bode's law, which assumption afterwards proved to be very far from the truth. Le Verrier was the first to announce the results of his computations to the world, and he wrote to Dr. Galle at Berlin requesting him to look in a certain portion of the heavens for the new star, saying that he would find it within a degree of the place. It was found by Dr. Galle within half an hour after the search commenced, and within less than one degree of the place. It was supposed at the time, and justly so, to be a triumph of mathematical genius and a complete verification of Newton's law of gravitation. It is, however, more than likely that it was a fortuitous circumstance that the planet was so near to the predicted place at that time. It is also pretty certain that Adams was entitled to his share in the honors, for he had previously predicted the planet's place, and it had been observed in England some time before its discovery in Berlin, but the observations had not been reduced. It certainly would have been found in England, if the English observers had been as expeditious as the German ones. Both of these mathematicians are equally deserving of the highest honors, and posterity has not failed to give it equally to them, although Le Verrier's name will be more closely connected with it, as the discovery was directly made at his suggestion.

Of recent discoveries we may mention that of the eighth Satellite of Saturn by the elder Bond at the observatory of Harvard College in 1848. This was, however, the seventh Satellite in the order of distance from the planet; the eighth one in distance having been known for upwards of 150 years. The two very small Satellites of Mars were discovered by Professor Asaph Hall at the United States Naval Observatory in August 1877, with the new 26-inch telescope built by Alvan Clark. They were both discovered on the same evening. They are each very small objects, the nearer one having a period of about 7 hours, 39 minutes, and the outer one a period of about 30 hours and 18 minutes, so that the inner one, with respect to Mars, will appear to rise in the west and set in the east, completing its apparent motion in about 11 hours; the outer Satellite rises in the east and sets in the west like all the other heavenly bodies, but it takes nearly 132 hours to perform this diurnal circuit, or nearly four times as long as its motion around Mars. The physical appearance of the planet Mars is interesting, for in addition to its general ruddy appearance, its polar caps, and its various shadings of orange and yellow, Schiaparelli discovered in 1877 and 1879 that there were a number of straight lines or canals, as he called them, crossing the planet in all directions and in 1881 he announced that some of them were double. This was so remarkable that it was doubted for some time whether they really existed or were subjective phenomena but the later observations of Lowell at Flagstaff, Arizona, seem to have abundantly proved their reality. Still they cannot be seen except in very clear regions, such as the bright, clear Italian skies, or those of the mountains of Arizona, or probably still better on the elevated plateau of Arequipa, Peru.

The next discovery of any note in the Solar System, was that of the fifth Satellite of Jupiter, by Barnard, with the 36-inch telescope of the Lick Observatory, in September, 1892. This is an extremely faint object and can be seen only with very large telescopes, and it is so very near Jupiter that it is almost always within its rays. It can only be observed with such instruments as the Lick and Yerkes Telescopes. It can barely be seen under very favorable circumstances with the 26-inch at Washington, but it is certainly beyond its power for continuous observations. Its period of revolution around Jupiter is about 11 hours, 57 minutes and 4 seconds.

The sixth Satellite of Jupiter was discovered by Perrine at the Lick Observatory, on January 5, 1905. This was the first visible observation, but Miss Leavitt, of Harvard College Observatory, on examining the plates of Harvard University on December 10th, 1904, found that she had already marked this sixth Satellite many times, but had thought that it might be an asteroid. It was very remarkable that it had been previously examined by her in 1894 and was found on nine plates taken during the year 1904. Its inclination to the ecliptic and the planet's equator is about 30 degrees. Its period of revolution is about 250 days, and its distance from the planet about 7,000,000 miles.

The seventh Satellite of Jupiter was also discovered by Perrine at the Lick Observatory on February 25th, 1905. It is exceedingly faint, of about the 16th magnitude and can only be seen with the very largest telescopes. It is estimated from photographs that it cannot be more than 35 miles in diameter.

The ninth Satellite of Saturn was discovered by Wm. H. Pickering, in 1899, from an examination of photographic plates taken with the 24-inch Bruce Telescope at Arequipa. He describes it as a new and faint Satellite of Saturn, having a period of about a year and a half. A further discussion of a large number of photographs served to determine the elements of its orbit. Eleven photographs taken by Mr. Frost at the Arequipa station, under the direction of Professor Bailey, enabled the astronomers there to follow the satellite from April 16th, to June 9th, 1904, and to correct its ephemeris. A full discussion appeared shortly afterwards in the annals of the Harvard Observatory, when an ephemeris was published with its approximate position, angle and distance for the purpose of enabling astronomers to look for it. It was visually observed by Barnard with the Yerkes telescope at Williams Bay, Wisconsin, on September 12th, 1904. Barnard gives its magnitude as 16.7. On August 8th, however, it is stated that he and Professor Turner of Oxford, England, who was on a visit to this country at that time, saw an object with the 40-inch Yerkes telescope resembling a star of the 15.5 or 16th magnitude. On September 3rd the object was missing, and he concludes that the August observation was the first visible observation made. Its position was not recorded, and it certainly seems somewhat remarkable that astronomers were able to trace its path for five years or more, when it could not be visually observed. It has been named Phoebe and is supposed to be variable, probably varying from about the 16.5 to 18.0 magnitude. I am not aware that it has been seen by any one but Barnard and Turner

On August 28, 1905, Wm. H. Pickering discovered the tenth Satellite of Saturn, which has been named Themis, at the Harvard College Observatory from an examination of photographs taken with the 24-inch Bruce telescope. Thirteen photographs were examined and the new satellite was found to have a period of about 21 days. Its distance from Saturn is slightly less than that of Hyperion, which had previously been supposed to be the seventh satellite in distance from Saturn. This new satellite is said to be about three magnitudes fainter than Hyperion. Unlike Phoebe it seems to show no sign of variability, and remains continually about the 17.5 magnitude, a little fainter than the mean brightness of Phoebe, and it must, therefore, remain invisible to the human eye, until larger telescopes are constructed. It has never yet been seen, still it is known to exist. Assuming that the intrinsic brightness of a unit of surface is the same throughout the whole Saturnian System, and that the largest satellite (Titan), whose diameter has been measured microscopically, is about 2,300 miles, it follows from their relative brightness that the diameter of Phoebe is about 42 miles, and that of this tenth satellite about 38 miles. It has been computed that a ball rather less than an inch in diameter observed at a distance of 3,000 miles would reflect about as much light as Phoebe or Themis.

In addition, two of the four Satellites of Uranus were discovered by Lassell, in 1851, and he also discovered the one Satellite of Neptune, in 1846, soon after the discovery of Neptune itself.

The number of comets is immense, and it seems almost certain that most of them move in nearly parabolic orbits around the sun and that they will never again be seen by us. Most of them are invisible to the naked eye, and can only be observed telescopically, for a short time near perihelion. There are, however, about 18 or 20 that have orbits so well known that they have been observed at different returns. Some appear to have such elongated elliptic orbits that it may be many hundred years before they are again seen. Among these may be mentioned the Comet of Donati in 1858, whose period is quite uncertain, but supposed to be no less than from 1,800 to 2,400 years, and possibly even greater than that. The comet of 1882, first observed by Finlay at the Cape of Good Hope, was well observed for a period of over seven months. It seems almost certain that its period is a little less than 800 years. My own observations and calculations extending over a period of more than a month gave a period of about 793 years. Others give results varying from about 750 to 812 years. Its perihelion distance was less than the radius of the sun, and it described an arc of 180 degrees in *true anomaly* in about three and one-half hours. About a month after the first observation its nucleus seemed to separate and divide into four or five different nuclei, and it is probably owing to this fact that these slight discrepancies arose as different observers considered either one of these four or five condensations as the central nucleus. The number of comets observed so far during the present year is nine, none of which has been seen with the naked eye.

The greatest advances, however, in astronomy has been made with the spectroscope. Since the discovery by Kirchhoff in 1859 of the laws upon which spectrum analysis depends, there seems to be no practical limit to the discoveries which may be made by it. Among others may be mentioned the physical constitution of the sun, comets, meteors and star clusters; the velocity of stars in the line of sight; and the absolute proof of the meteoric theory of Saturn's rings, this latter was accomplished by Keeler in 1895, at Allegheny, Pa, in proving that the particles at the outer edge of Saturn's rings were moving more slowly than the inner, which would not be the case if the rings were continuous. The observations at Williams Bay, Wisconsin, with the Yerkes Telescope; those at Mount Hamilton with the Lick Telescope; and those of the new Solar Observatory at Mount Wilson are likely to give the most information in these respects, although a great amount of very valuable work has been done in Germany, France and England. It seems reasonable to expect that most of the brilliant discoveries of the future will be in the fields of photographic and spectrographic astronomy. In the astronomy of double and variable stars a great amount of work has been done, especially at the Harvard University. Among these variables may be mentioned, stars whose variations are gradual, those that fluctuate irregularly, those that suddenly blaze out and disappear, like the star seen by Tycho Brahe at Copenhagen in 1572, which suddenly appeared almost as bright as Jupiter, increasing in brilliancy until it was brighter than Venus at its greatest brilliancy, and then after about 16 months became invisible to the naked eye, which was the only means at command for observing it as this was before the invention of the telescope. Several stars of this type have appeared within the last 20 years. The one in the great Nebula of Andromeda in 1885; the one in Anriga in 1892, and the one in Perseus in 1901, are probably some of the most remarkable. There are other varieties of variables known as long period variables, and short period variables. The one having the shortest period known at present was discovered by H. M. Paul at the U. S. Naval Observatory, on April 13, 1888, and announced in the Astronomical Journal on March 28, 1890. It goes through its period in 7 hours, 46 minutes and 48 seconds, and only varies by about half a magnitude. Other variables, like Algol remain bright most of the time, and then apparently become suddenly eclipsed as though occulted by some unseen star revolving around it. That this is the true explanation was proved spectroscopically by Vogel at Potsdam in 1889, and in observations on Algol and the period of revolution of the two stars and their masses were determined, an illustration of the fact that the orbit of a double star had been practically computed before any one had even seen it. The existence of a companion star was proven in the case of Sirius before the invention of the spectroscope. It was observed that there were small deviations from the computed place of Sirius and these small oscillations and perturbations enabled astronomers to compute the position and orbit of the disturbing body. This small disturbing body was seen by Alvan Clark in 1865, but the evidence of its existence was complete before its visual discovery.

The problems of the material universe are so vast that we can only expect to get a glimpse of them and there are no doubt numbers of them that will ever remain unsolved. The composition and shape of Nebulæ and star clusters, the parallaxes and distances of the stars the motion of the Solar System in space, the composition of the sun and the proper motion of the stars are all problems of great interest.

In the domain of Theoretical Astronomy, it is interesting to know that the United States has contributed her full quota. During the last half century the books prepared by Professor Brünnow, at Ann Arbor, and Professor Chauvenet, at Annapolis on Spherical Astronomy are probably equal to any books published on that subject; that of Professor Watson, at Ann Arbor, on Theoretical Astronomy ranks very high as a text book on that particular subject; the works of G. W. Hill on Celestial Mechanics are acknowledged by the most competent experts to be equal to the very best; and the latest book of Professor Newcomb on Spherical Astronomy is a very valuable work, while the popular works on Astronomy by Newcomb and the series of books on that subject by Professor Young, of Princeton, are up to date and all that can be desired as a popular presentation of the subject.

RESUMÉ OF RESEARCHES IN THE HIGHER METEOROLOGY.

By Frank H. Bigelow, L.H.D., Professor of Astro-Physics.

Preliminary Remarks.

The writer of this paper has been working for a number of years under the auspices of the U. S. Weather Bureau, to throw light upon the relations between the amount of the variable energy emitted by the sun and the corresponding changes in the circulation of the earth's atmosphere. This complex problem has been the subject of scientific research for a century, but it is only within the past fifteen years that important progress has been made. The first set of observations that attracted attention to the variability of the sun was the periodic change in the number of the sun spots; corresponding with that there is a synchronous variation in the frequency of the number of the auroras, and in the intensity of the magnetic field. There had been some efforts made to trace out the corresponding variations in the meteorological elements, namely, the pressures, the temperatures, the precipitation and the storm intensity in various regions of the earth, but on the whole the synchronism was not very satisfactorily exhibited. There were numerous symptoms of such a connection between solar activity and the climatic or weather conditions on the earth, but the solution hardly reached the required grade of scientific precision required to carry conviction to the minds of students generally. That there was a problem worthy of attack was probable, and yet the discouraging features were such that it required considerable determination to deliberately take up the work. The unusual complexity of the interrelated sciences, and the enormous masses of data that required to be discussed were the principal objects of difficulty to be overcome.

The writer's previous training had, in some degree, adapted him to take up this special research, and it may be worth while to make a record of those circumstances. Five years of work with Dr. B. A. Gould in the Cordoba Observatory, Argentine Republic, had acquainted him with the best methods of treating great quantities of astronomical data with the view of rendering the individual observations homogeneous; three years of experience in the Naval Observatory and Nautical Almanac with Professor Simon Newcomb on his planetory tables had developed the practise of long and intricate computations; six years as Professor of Mathematics in Racine College had given some facility in the use of mathematical analysis. The coming thus equipped to the study of meteorology gave some advantages over those who had been trained in the prevailing theories, by reason of being able to examine them more impartially than might otherwise have been possible. Dr. Gould often stated that he believed that solar variability could be matched by the climatic conditions on the pampas of Argentina, and it has since been proven that this is the case, inasmuch as that region with its equable weather is peculiarly fitted to register the incoming solar energy, quite undisturbed by the cyclonic circulations prevailing so vigorously in other districts, as the United States. The interest thus early aroused in this problem gradually changed my astronomical activity to solar physics, and to an examination of the synchronisms to be detected on the sun and on the earth. In spite of the discouragements attending such a massive research as this has been, the absorbing character of the problems, and the hope of establishing a valuable practical process of long range forecasting has been an unfailing incentive to persevere. The general features of the research may be summarized under three heads, namely:

I. The solar-terrestrial electric and magnetic fields.

II. The circulations of the atmospheres of the sun and of the earth respectively, and their mutual relations.

III. The reconstruction of the observational data.

The first involves questions in solar physics as to the electrical and magnetic conditions in the solar and terrestrial envelopes, and their physical connections by external magnetic fields and by radiation energy; the second comprised a series of problems in the thermodynamics and hydrodynamics of the two atmospheres respectively, the general circulation, and the secondary circulations in local cyclones and anticyclones; and the third implies the recomputation of the long series of observations on the sun for the spots, prominences and faculae; and on the earth for the temperatures, pressures and vapor tensions, which must be reduced to homogeneous systems. The rapid accumulation of observations of all sorts, in many cases without systematic discussion, the remarkable improvement in instruments of precision, and the numerous scientific papers coming from the press make it very difficult to keep in touch with all branches of the subject of cosmical meteorology. Indeed, the growing recognition of the value of these topics is to be noted in the organization of numerous societies, international and local, to discuss the details and subdivide the work; in the foundation of new observatories, Mt. Wilson, Pilar, Tortosa, Mt. Weather; the increased activity at the older institutions, Yerkes, Smithsonian, South Kensington, Meudon, Potsdam, Zürich and Catania; and in the greater number of scientific researches and papers planned to elucidate the several features of the general problem. We may now pass to some details to explain these preliminary remarks.

I. *The electric and magnetic fields of the Sun and the Earth.*—One of the important subjects of debate in science is the magnetic state of the sun. Opinion has fluctuated for and against the sun being a highly magnetic sphere, as it were in response to the ebb and flow of the tide of the advancement of the science of electricity and magnetism. There have been three strong arguments urged against the probability of the sun being a large rotating magnet, somewhat like the earth with which we are familiar, carrying with it an external magnetic field of force. The first is that the intense heat of the sun is fatal to its mass being magnetized, the second is that the great magnetic storms felt on the earth would require so great a change in the sun's normal potential to emit the required energy as to be prohibitive; and the third is the difficulty of accounting for the variable magnetic field at the earth in synchronism with the period of the solar rotation, which implies that the structure of the sun is not homogenous in longitude so far as radiation is concerned.

The Sun's heated mass, magnetized or not.—The answers to all these questions really depend upon the exact constitution of matter itself, and until our knowledge of that is complete we must be content with more or less speculative hypotheses. During the years when the argument seemed to be against the sun as a magnetic sphere, the original form of the kinetic theory of gases held sway. On this view matter consisted of highly elastic, smooth spheres of small dimensions, undergoing collisions of a high order of number per second, and under this conception there is certainly no easy path to the theory that the sun as a mass of highly heated gas is also magnetic. It seemed worth while, however, to accumulate the available circumstantial evidence in favor of the magnetic sphere hypothesis, while waiting for the complete explanation. Primarily, the fact that the *earth while very hot in its interior yet sustains a magnetic field dependent upon internal magnetization,* seems to require the admission that in some way the sun and all hot rotating celestial bodies may likewise be magnetized spheres. It is proper to look to the prevailing theory of matter as the real topic of investigation. This general point of view is greatly strengthened by the physical aspect of the sun itself. Improvement in the photography of coronas during the successive solar eclipses shows that in the years of minimum activity the rays of the corona take on forms exceedingly like the field of a magnetic sphere. The equation of the lines of force seems to be equally applicable to both objects. Pursuing the subject further and regarding the rays seen on the photograph as the traces in projection of the rays springing from the sun in three dimensions, it was found that the bases of these rays tend to concentrate in a ruffle surrounding two poles, or centers of coronal divergence. An experiment on the electrostatic lines of a sphere in a magnetic field shows that the *visible* rays recede from the poles, and accumulate in maximum rings like the auroras on the earth. Noting carefully the angular position of these coronal poles from one eclipse to another, it was found that the poles do not lie on a diameter but are somewhat asymmetrically displaced, and that the successive positions can be matched by turning a model of the solar corona around in a period of rotation assumed to be that of the sun itself at the equator. If solar action at the photosphere produces very light materials which are ejected by repulsive forces, such as electric repulsion, or the mechanical pressure of light, and this system is located on a magnetized sphere, then the effect is just what one would expect to find in the external coronas.

The recent developments of researches into the constitution of matter have resulted in showing that probably the atom is a highly complex dynamic and electrical structure, composed of rotating ions under mutual attractions. If matter consists ultimately of moving charges of electricity, then it is evident that all matter sustains complex magnetic fields depending upon the movements of these structural electric charges. External fields depending upon internal magnetization imply that the internal motions of the electricity are polarized, and that the electric currents on the average are parallel to a given plane. An increase in heat may destroy the field of a steel magnet by disorganizing the impressed polarization, but it does not destroy the possibility of magnetization if there is any force sufficient to produce polarization at the same time. It is well known that the rotation of a celestial body on its axis produces such a force acting at right angles to the path of a body in relative motion. This may be the primary cause of the observed polarization of the sun's material as shown in the external rays of the coronas. The Zeeman effect indicates that all matter emitting light is magnetic; the study of the series of lines in the spectrum, the shifting of the lines under pressure and the attendant phenomena, seem to be best explained on the hypothesis of rotating atoms and ions carrying electric charges with them. I am, therefore, of opinion that the theory that the sun is a highly magnetic sphere has gained considerable strength within a few years, and that the subject, though complex, is worth further research.

The energy of great magnetic storms.—Lord Kelvin's evaluation of the energy formula,

$$E = -\frac{1}{8\pi} \iint V \frac{dV}{dn} \, dS.$$

for the variation in the earth's magnetic field during a great storm shows that the corresponding change in the sun's potential V is too great to be permissible. His inference that the supposed connection is unreal implies that the energy of the solar storm depends solely upon the variation of the potential, but this may by no means be the fact. Indeed, there are two lines of argument which indicate that this source of energy is only a part of the supply available to affect the terrestrial magnetic field. (1) The sun as a magnet acts through its external field upon the earth; (2) the radiation field of the sun is now believed to be variable in its intensity in solar longitude, so that during a rotation of the sun it acts more or less intensely upon the earth's atmosphere; (3) the ionization products in the atmosphere of the earth, depending upon solar radiation, have circuits of their own which may properly affect the earth's field temporarily, after receiving a comparatively small impulse to start them, sent from the sun. The complexity of this physical problem is, therefore, by no means exhausted by the potential theory.

More specifically, on compiling the data of the earth's magnetic field in the period of the sun's equatorial rotation, which may be assumed to be that of an internal nucleus from which the external outgoing energy is ultimately derived, it was found that a certain typical curve of magnetic variation was obtained having these characteristics; there are two principle maxima, on opposite sides of the sun, and there is a series of minor crests superposed upon this primary curve, showing that for some reason the solar output is not uniform in longitude. Similar compilations for the sunspots and prominences match this curve with some degree of precision on the sun; extensive discussions of the terrestrial temperatures, pressures and vapor contents of the atmosphere also give the same curve for the earth. These conditions are so various, and the fundamental impulse so persistent in the solar elements, the earth's magnetic field and its meteorological elements, as to render it evident that one common expenditure of solar energy is really responsible for them all. These results have been published at intervals since 1893, when the first preliminary examination had been made. In 1905 Mr. Maunder showed from his study of the large magnetic disturbances by themselves that they tend to concentrate on opposite sides of the sun, thus confirming my earlier conclusion. A careful discussion of the temperatures of the lower strata of the atmosphere, as derived from the balloon and kite ascensions in Europe and North America, shows that the temperature curves near the surface of the ground change their character in the free air, in such a way as to afford a simple basis for an explanation of the variation of the magnetic field by movements of the ions in streams as controlled by these temperature waves. This makes the line of cause and effect quite intelligible: (1) variable radiation in solar longitude, depending upon the structure of the solar mass, (2) variable ionization and temperature effects in the earth's atmosphere, (3) sychronous variable magnetic field, and circulation of the earth's atmosphere, giving local changes in pressure, temperature, rainfall and climate. The details of computing the observations which lead to these conclusions are very extensive, and they have been published only as brief summaries or extracts. They include a careful compilation of the strength of the magnetic field from day to day, 1841-1905, in diagrams and tables; (2) a complete compilation of the solar prominence observations, 1872-1905; (3) a complete rediscussion of all the pressure, temperature and vapor tension observations, more than 200 stations for the United States, 1871-1905; (4) miscellaneous discussions of the meteorological elements in all portions of the earth, the magnetic field at 30 stations for the diurnal period, the ionization phenomena, the auroras; and on the sun, the spots, faculae and prominences. Could this material be published, it would form the basis of the proper study of this solar-terrestrial problem in cosmical meteorology. The recent and more refined tabulations, 1872-1905, for the prominences, magnetic field and temperatures of the United States are decisive so far as the *annual* synchronism is concerned, and we are now trying to extend the discussion from the annual to the monthly variations in the United States, with the hope of establishing the possibility of so-called long range or seasonal forecasts of the weather conditions. The problem fifteen years ago was generally considered to be merely interesting as a speculative scheme; today it has passed out of that stage of development into a state where work and skilful discussion of the data give us promise of an ultimate success on a strictly scientific basis. The demand for trained students capable of treating the numerous problems in physics, astrophysics and meteorology arising from these observations, is such that provision must be made in the universities for educating this class of investigators.

II. *The circulation of the atmospheres of the sun and of the earth, respectively, and their mutual relations.*

1. *The circulation of the solar mass.*—The problem of the circulation of the mass of the sun is difficult to solve because of the necessity of passing by inference from observed surface conditions to those corresponding with them in the interior. The Italian spectroscopical observations, 1872-1905, have proved to be very valuable in giving a fair idea of the distribution of the prominences and faculae in different latitudes, from which rotation periods in longitude can be approximately computed from the equator to the poles, 26.68 days at the equator and 29.50 days near the poles. The movement of the sun spots in longitude and latitude has been carefully studied by several investigators. The variable frequency of these objects and their movements show that the solar mass is in constant circulation, in a rough periodic fashion, of which the 11-year period is best known. Schuster has recently analyzed the general curve into elements $\frac{1}{3} \times 33.375 = 11.125$, $\frac{1}{4} \times 375 = 8.344$, and $\frac{1}{7} \times 33.375 = 4.765$. The short period found by me in the terrestrial elements, 2.750 years, is distinctly shown in the solar prominences and sun spots. Now, the primary perplexity in trying to apply thermodynamic relations to the solar mass is the inability to assign the proper value to $k = \frac{Cp}{Cu}$, the ratio of the specific heats. In the earth's atmosphere this value is 1.41, but on the sun it may range from 1.66 if the material is strictly monatomic to 1.10 if the molecules are of highly composite structures. The former hypothesis leads to such enormous pressures and temperatures, using the adiabatic law, as to be incredible; the latter is satisfied with very moderate pressures and temperatures, say surface temperature just within the photosphere 7.500 degrees and near the center 10.000 degrees, with corresponding pressures and densities. We may discuss the subject from the view of dissociation of the atoms under high temperature, as is likely to be the fact in the solar atmosphere where the pressure is removed and the spectroscopic lines

are formed; or we may lay the emphasis upon the balancing of the internal pressure and temperature so that there is formed a quasi-solid nucleus. The leisurely circulation apparent at the surface of the sun certainly suggests a slowly moving, highly viscous condition near the center, and this seems to be most in harmony with the facts. But this transition from k=1.66 near the surface to k=1.10 in the interior implies a change in the structure of matter itself, which, indeed, in solar physics may actually be the case. We need especially to find some clue to the function controlling these values of k.

To assume certain surface temperatures and a given k, and then by the adiabatic formalae to compute corresponding internal values is of course merely a numerical process, in the present stage of science, and probably not very valuable, though testative discussions are of course necessary. Allowing that k is not known, we may yet form some idea of the sun's interior circulation by resorting to the general equations of motion, and finding the relation between temperature and velocity using those values of the pressure determined by the assumed k. Helmholtz and Emden have discussed this subject for the sun, with the general result that the sun is a huge vortex, whose axis is parallel to the axis of rotation. The period decreases from the equator to the poles, and the temperature increases from the equator to the poles. The several elements of the vortex produce discontinuous surfaces, or layers of different temperatures sliding past one another, in such a way that the vortex filiments rotate in the right handed sense looking from the equator to the North pole. In case the solar mass consists of elementary electric charges this structure is favorable to producing the magnetization mentioned above as probably prevailing in the solar mass. If we admit this circulation and variability in the periodicity, then the entire mass of the sun should pulsate, and even change its shape, as shown by the relative length of the polar and equatorial diameters. Poor's examination of the Rutherford photographs, 1860-1874, some German Heliometer measures, 1873-1875, and 1880-1883, and 1890-1902, bears upon this interesting question. The result of the discussion as reported is that the equatorial diameter is longer than the polar at the time of the sun spot maximum, and shorter in the sun spot minimum. A comparison of the details of the variability in Poor's paper with the periodic variability or rotation given in my paper on the circulation of the sun's atmosphere, Monthly Weather Review, October, 1903, shows that the same synchronism exists between diameter and rotation. The period of rotation is lengthened in the polar region as the polar diameter is shortened, and in some way the bulging of the equatorial zone is accompanied by a slowing down of the periodic rotation in the polar zones. The difficulty of handling the observations correctly is such as to produce matters for discussion, but it seems to me that this result is in agreement with the structural vortex required by the general equation of motion. The entire subject constitutes one of the fascinating, yet difficult problems of research in solar physics.

2. *The general circulation of the earth's atmosphere.*—The theoretical connection between the circulation of the solar mass, and that of the earth's atmosphere is not so remote as might be supposed. In the case of the earth its atmosphere is subject to two principal motions, an eastward drift in the temperate zones with the velocity increasing upwards from the surface, and a relative increase upwards of the temperature; also a westward drift in the tropics with a decrease of the velocity upwards and a relatively rapid decrease of the temperature upwards. Thus, on a non-rotating earth the temperature gradient might be at some given normal value for each latitude, depending upon the conduction and convection of heat in a vertical direction. With a rotating earth this temperature gradient is diminished in the temperate zones, but increased in the tropical zones, and this conforms to our observations. Now, the general equation used for the sun has three cases for its solution, and two of these cases apply to the earth's atmosphere as just described. The presence of the land and water areas tend to produce local modifications on a large scale, so that the practical application of the equation is not readily executed. Indeed, we shall have to wait for suitable observations in the higher levels of the atmosphere by means of balloons and kites before the solution can be completed. The temperatures in the north temperate zone have been fairly well explored by the work done at Berlin, Hald, Trappes and other stations in Europe, and at Blue Hill in the United States. Results are being reported from the ocean areas by Hergesell, Teisserenc de Bort, Rotch, Clayton, Fassig and Bigelow, extending into the tropics. No high altitude records have been made in the Southern Hemisphere, but Mr. Davis is planning such a campaign in the Argentine Republic. The scheme of circulation here mentioned differs radically from that proposed by Ferrel, and elaborated by Oberbeck. Their canal theory taught that the warm air of the tropics rises from the surface, spreads towards the poles, descends in high latitudes and returns to the tropics near the surface. This is only true in part. My theory shows that this single circuit is broken up into three circuits, one in the tropics, anticlockwise in the Northern hemisphere for an observer looking eastward; the second in the temperate zone and circulating clockwise; and the third in the polar zone being anticlockwise in its direction. A portion of the heated air of the tropics escapes poleward in the high levels, and a portion leaks out poleward in the lower levels. In the temperate zone there are counter currents near the surface and up to five or six miles high, consisting of northwest winds bearing cold air, and southwest winds carrying warm, moist air. In the tropics the northeast trade winds near the surface reverse into southwest return trades in the higher levels, though they do not extend beyond the tropic zone. The northwest winds of the temperate zone in the higher levels overspread the tropic zone to some extent, and tend to

mix with the warm air from the equatorial belt. These are thus two great mixing regions, one near the surface, 0 to 3,000 meters, and the other in the high levels, 10,000 to 14,000 meters, but between them the eastward drift is not much disturbed by air transported into it from the tropics on those intermediate levels. The high pressure belt near latitude 33° at the surface spans the tropics in a lofty arch, six miles high over the equator, and this separates the eastward from the westward drift. This belt, instead of being continuous around the earth, as theory suggests, is broken up into great anticyclonic centers of action, in summer central over the ocean areas, in winter central over the continental masses, according to the prevailing surface temperatures. Hence, in summer over the Atlantic ocean in the northern hemisphere, southwest winds prevail on the North American side bringing the moist warm air that characterizes the summer season in the United States; on the other hand, northwest winds prevail on the European side, and the summer weather is in consequence dryer and generally cooler. This causes the trend of travel from America to Europe in the warm months of the year. In the winter a cold high area settles over North America and another over Europe and Asia. The prevailing eastward circulation brings this high area with its cold to the south and eastward in America, with cold waves and severe weather; while in Europe the outflow of cold from the Asiatic high area is retarded by the same eastward drift, and Europe is protected partially from the severe cold weather which prevails in Siberia and is proper for that high latitude. Thus, Europe is cooler in summer and warmer in winter, than the United States, strictly in accordance with the meteorological processes of the general circulation. The influence of the waters of the Gulf Stream upon European weather is insignificant in comparison with these effects of the atmospheric currents. At present the facts regarding the general circulation are attracting wide attention and vigorous research, observations are being made in increasing numbers yearly, and students equipped with hydrodynamics and thermodynamics are needed to carry on this work.

3. *The local circulation in the earth's atmosphere.*—The theoretical development of the causes that produce and sustain the circulation in storms, the cyclones and the anticyclones of the temperate zones, has been singularly unsuccessful, considering the amount of study that has been bestowed upon this subject. The trouble has arisen from the early introduction of several incorrect general theories, which have continued in the literature of meteorology with unusual persistency. In consequence of the fact that the barometric pressures of cyclones and anticyclones on the sea level plane are arranged more or less symmetrically about a central axis, it was perhaps not unnatural to assume that warm-centered or cold-centered temperatures should likewise to be symmetrically distributed about the same center. Consequently central vortices only have been studied, and a persistent effort has been made to account for the forces required to derive

these circulating structures, namely a column of air ascending rapidly in the central regions of the cyclone, but descending in the anticyclone. The favorite physical cause of such a column of buoyant air has been the latent heat derived from the condensation of vapor into water, as proposed long ago by Espy and advocated by Ferrel, Abbe and others. A brief examination of the synoptic charts show that these ideas cannot be correct even in their broad features: (1) The warm areas are not distributed symmetrically about the central axis in cyclones, at least on the surface charts, but rather the warm area lies between the center of the cyclone and the anticyclone on one side, while the cold area lies between the anticyclone and the cyclone on the other side. In a word, storms are relatively warm in the eastern quadrants in the United States, and cold in the western quadrants, and the minimum of cold and the maximum of warm air, respectively, are on the borders of the cyclones and the anticyclones instead of at their centers. (2) The second difficulty with the latent heat theory is that many storms occur in a highly developed state without any rainfall, and many large rain areas do not develope any cyclonic circulation. Now, there may have been some room for discussion while the temperature observations were confined to the surface, but with the accumulation of the upper air observations by balloons and kites, it has been made plain in my papers that the same asymmetric distribution of temperature persists from the surface at least to the height of five or six miles. This fact, therefore, changes the entire trend of meteorological literature, and while there exists vertical convection in the cyclone, it is really the horizontal convection that is chiefly responsible for the energy in storms. Ferrel proposed one type of central vortex which is inadequate to the case, and German meteorologists have developed another type of central vortex, likewise defective when applied to these phenomena of the circulation. In my researches the following steps have been developed in the attempt to build up a new theory of storms. In the international campaign of 1896-97 for the measurement of the velocities of the upper strata of the atmosphere by cloud observations, the form of the circulation in the several 1,000-meter levels has been thoroughly mapped out; in the discussion of the barometric pressures of the United States and Canada, the pressure distribution at three levels, sea-level, 3,500-foot, 10,000-foot, have been carefully discussed; and in my recent papers on the Thermodynamics of the atmosphere the temperatures in the upper levels as observed in Europe and North America have been worked up. These three systems are now in harmony, and form a most interesting problem for mathematical development.

It was shown above, in the section on the general circulation, that in the restoration to normal temperature equilibrium there are warm currents from the tropics which meet cold currents from the polar zones, and that these counter currents flow together in the temperate zones. Their mutual interaction produces the observed cyclones and anticyclones, chiefly by the operation of horizontal connection between air masses of different temperatures. The details of this computation are too extensive to be reproduced in this paper, but, in a word, we deal simply with those gradients of pressure and temperature, which result in just such circulations as are found to eist. The point of view is, therefore, radically changed, from (1) a supposed central symmetrical column of warm or cold air, respectively, giving rise to vertical convection; to (2) horizontal convection between two masses of cold and warm air asymmetrically disposed to the centers of gyration. The far-reaching character of this idea, in its application to local circulations can readily be seen. When two masses of air of different temperatures flow together under the impulses of the general circulation, they primarily set up cyclones and anticyclones, as the dynamic effects of the thermodynamic causes. Similarly, the cloud observations in the West Indies show that hurricanes are generated in the higher strata of the air when two currents of different temperatures flow together, the great tube penetrating to the surface by strictly vortex motion. Our study of the great water spout at Cottage City, Mass., shows that two masses of air of very different temperatures were operating upon each other on that occasion in the cumulas cloud levels, so that tornadoes and water spouts have exactly the same origin as hurricanes, the former being vortex tubes one mile high, and the latter as much as six miles high. The vigor of these vortices depends upon the contrast in the temperature, say 20 to 30° Fahrenheit. The hail accompanying a tornado is found to be the result of snow nuclei falling through the series of ragged stratifications where the warm and cold air mutually interpenetrate in a vertical direction. Thunder storms are likewise the products of the interaction of such warm and cold masses as arise in the course of local superheating of the surface layers in warm weather, this being really a case of vertical more than horizontal convection. It is, thus, impressive to see in the atmosphere one simple principle dominating its circulation—(1) the heated air of the tropics and the cold air of the polar zones counter-flowing and interpenetrating to form the general circulation; (2) the smaller currents of warm and cold air counter-flowing in the lower levels to form the cyclones and anticyclones of the temperate zones; (3) the still smaller masses of warm and cold air counter-flowing in the high levels of the tropics to form the hurricanes, and in the low levels of the temperate zone to generate tornadoes and water spouts; and (4) the still more contracted operation of these forces in thunder storms, and the numerous minor whirls observed in the atmosphere. This sub-division of thermodynamic energy goes on to yet smaller dimensions and forms an important element in the internal dynamic friction, which retards the rapid onward flow of the currents of air. These dynamic motions from large to small are the sufficient sources of the retardation by which the atmosphere is kept flowing at comparatively moderate velocities instead of at such high velocities as to be continuously destructive. Thus, in the temperate zones a few miles high, winds of 90 to 120 miles per hour are always prevailing, while at the surface the wind is usually 10 or 15 miles per hour and even less than that. The numerous problems arising in the thermodynamics and hydrodynamics of the atmosphere are evidently such as to call out the energy of able students, who require special training to make progress in such researches. There is really no field of modern science that is so well fitted to repay the labors of investigators as that opened up by the observations of the upper atmosphere, now being made accessible by balloon and kite ascensions. The entrance into meteorology of advanced students in physics and astrophysics is one of the most encouraging signs of the times. The field is, however, so very large that close specialization is now required to develope the various branches of the subject.

III. *The reconstruction of the observational data.*—Meteorological observatories in most instances have been more dependent upon the exigences of the local services than upon the ultimate demands of rigorous science, and the result has been that they are not usually homogenous for a long series of years. The local offices have been changed, the instrumental conditions have varied, but especially the methods of computing the observations have not been satisfactory. The demands for increased efficiency in meteorology, such as an improvement in forecasting, and applications in solar-terrestrial meteorology, have made it important that the original records should be made homogenous and reduced to standard conditions. For this purpose the entire system of the barometry of the United States and Canada has been rediscussed for the years 1873 to date, the corrections for altitude, gravity, instruments, hours of observations have been applied. the discussion of the temperature gradients on the plateau and in the low level districts give the required temperature arguments, and finally, reduction tables to the sea-level, the 3,500-foot and the 10,000-foot planes have been prepared for all the stations. We have made for a year, 1903, daily weather maps of pressure on these planes, and they have proved to be very instructive in studying the theory of storms outlined above. An extensive report has been prepared on the subject, and it is evident that similar high level auxiliary maps will be employed in forecasting not only in the United States, but in Europe and South America, where regular forecasting services are established. Similar recomputations of the temperatures and vapor tensions for the United States are in progress, for the purpose of securing normals depending on 33 years of observations, 1873-1905, for forecasting and climatological work, and for the development of cosmical meteorology by comparing the annual and monthly variations with the relative frequency of the sun spots, the faculae and the prominences. It can be stated that from a preliminary comparison with this excellent temperature data, there is a continuous synchronism in the *annual* variations of the solar prominences, the terrestrial magnetic field and the temperatures and pressures of the United States. That fact may be considered as fully established, and it shows that the solar energy registers itself synchronously in these three types of phenomena, so that a fundamental function really exists between them, if it can be fully worked out. In the comparison for the *monthly* synchronism the harmony is less persistent, but it evidently takes effect between the prominences and the temperature up to 75 or 80 per cent of the maxima and minima. The massive amount of this material required much work in its construction, but there is promise of a good practical result when this data can be suitably studied and digested. It may be said that this is the first reliable data that can properly be used in any definite solar-terrestrial studies, aside from those of a distinctly preliminary kind, necessary in testing the possible promising lines of development. At present the great demand is for liberal printing of this revised data, since it summarizes the work of the American Meteorology for the first third of the century of its existence. Without it our work is relegated to the vaults, and but very little of it can reach other scientists and the public.

PATHOLOGICAL REPORT AND HISTOLOGICAL STUDY OF AN ENDOTHELIOMA OF THE CEREBELLUM, WITH SOME GENERAL REMARKS ON THE FUNCTIONAL DIFFERENCES BETWEEN THE CELLS OF ENDOTHELIUM AND OF EPITHELIUM.

By James Carroll, M.D., Professor of Bacteriology and Pathology.

The following amplification of a report of the pathological examination of a tumor of the cerebellum was written about nine years ago, but its publication has been delayed by the work incident to the breaking out of the Spanish-American War, the pursuit of investigations into the etiology of yellow fever, and the desire to include additional cases of endotheliomata, as well as to discuss at greater length the general subject of the functions of the cells of endothelium as compared with those of epithelium. While many other endothelial new growths have been encountered, the time necessary for detailed histological investigation has been lacking; nevertheless this single unique tumor belongs to a group of such great interest and importance that it deserves the most careful consideration and study.

The case was originally reported by Professor E. L. Tompkins of Columbian (now George Washington) University, in the Virginia Medical Semi-Monthly for February 12th, 1897, and from this the clinical history is taken. Those who are interested in the gross and microscopical characters of this tumor are referred to the photograph and photo-micrographs published with Dr. Tompkins' clinical report, which includes three cases.

> Clinical History. "Case III. James L. aet. 16, white, came to my clinic at the Emergency Hospital on December 6, 1894. His history was as follows: About two and one-half years ago, he had typhoid fever, but had never had any convulsions. Soon after, he began to have severe pain in the back of his head and vomiting. About two months before he came to me, his mother noticed a change in his voice, and that he tottered in his gait. Now he has headache all over his head, but only at times; it aches worse after getting up from the recumbent position.
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> On examination, I found that his head was rather large, eyes very prominent, and nystagmus well marked. He reeled in walking, always to the right; was unable to walk a straight line and had to be supported on either side. Both knee

jerks exaggerated; ankle clonus well marked in left leg, only partially so in right; but right leg appeared to be weaker than left. Choked discs of both eyes, but does not complain of loss of vision. Mental and muscular movements apparently rather slow. He walked with legs apart, and with much inco-ordination. His mother had been told that he had 'spinal disease' by several physicians.

I at once thought that he had a tumor of the cerebellum, and put him on increasing doses of iodide of potassium.. He came to the clinic for about a year, sometimes feeling better, at other times worse; and finally I lost sight of him, until August 31, 1896, when I was sent for and found him practically dying, having not seen him for about a year.

I made the *post-mortem* examination, and found the tumor which I now present to you. The tumor lies imbedded in the under and anterior portion of the right hemisphere, encroaching decidedly over the median line and pressing on the medulla.

Another interesting feature was the very large quantity of cerebro-spinal fluid that escaped as soon as the dura was opened, there being at least a quart that came in a perfect gush."

Anatomical Diagnosis.—*Endothelioma of the dura mater, growing into the right cerebellar hemisphere from below in such a manner as to form an excavation in which the tumor rests, the pia mater and arachnoid being carried before it.*

The tumor is about as large as a small orange, and is shaped like a strawberry, its base being external and the blunt flattened apex completely hidden within the cavity in the cerebellum. Besides entering and compressing the lobe of the cerebellum on its own side, it has also displaced the medulla, pons, and other important tissues towards the opposite side. The tumor can be easily shelled out of its bed, and the surface in contact with the cerebellum is then seen to be marked by numerous shallow depressions or sulci where the pia with its vessels has been removed. These vein-like sulci mark the positions occupied by the vessels carried in the membrane. Upon partially withdrawing the tumor from its cavity its surface is found to be covered by the vascular pia mater, while the base or pedicle is slightly roughened at the site of its attachment to the dura mater, which is reported to have been easily stripped off. This can be explained by stating that the growth contains but little fibrous tissue, and consists solely of columns of large epithelial-like cells, supported by a very delicate stroma carrying thin-walled blood vessels.

The vascular pial membrane covered the entire surface of the growth wherever it came in contact with the cerebellum, was carried into the cavity before the tumor, and reflected thence to its normal position upon the surface of the organ. The membrane retained its normal relation to the cerebellum as long as the tumor remained undisturbed. The mesial border of the tumor has not been disturbed, and shows the intact membranes, vessels, and nerves, holding the mass quite firmly in position. Its thickened ventral margin is broken by a rather large gap, made by the removal of several pieces of the tissue for histological purposes before the photograph was taken. The lateral expansion and thinning of the cerebellar hemisphere by pressure are well shown, and so is the lateral displacement of the pons and medulla. The tumor entered the right hemisphere of the cerebellum from below and in front, its apex being directed backward and slightly upward.

The histological picture presented by this neoplasm is that of an abnormal and exaggerated reproduction of the perivascular lymphatics, surrounding and supported by a relatively insignificant number of delicate blood vessels; the most striking feature being a remarkably free and luxuriant growth of the endothelium lining these lymph vessels. The endothelial cells referred to present all gradations in form and type from the low, flat, almost squamous cell, through the cuboidal and low columnar to high columnar forms, which exactly resemble the reproduction of glandular epithelium in some carcinomata. In places there appears a tendency toward a stratified and even alveolar arrangement, but this is rare. The prevailing types are large, cuboidal, or columnar cells arranged to form tubular spaces, and close inspection will disclose that these tubules, so to speak, bear a definite and constant relation to the thin-walled blood vessels, i. e., they are arranged systematically about them and tend to run in the same general direction. The vessels are central, and the gland-like spaces are peripheral, the axis of the lumen of the vessel running in the same general direction as those of the more or less enlarged lymph channels surrounding it. There is a remarkable absence of stroma of any kind; the adventitia of the vessels serves as a sort of basement membrane supporting the endothelial cells of which the bulk of the growth consists. The beautiful tubular arrangement of the structure, with its large juicy cells and brightly staining nuclei, suggested at the first glance adenocarcinoma, but the normal dura mater contains no epithelial cells from which such a structure could originate, while that membrane is particularly rich in lymphatics. The contents of these newly-formed and often dilated lymph spaces in the specimen proved of considerable interest, and determined the character of the new formation. There were numbers of small lymphoid cells (the normal lymph corpuscles) with a limited amount of protoplasm and round, deeply staining nuclei; other forms with larger nuclei and relatively more protoplasm; others again were large polygonal cells with pale protoplasm and oval or indented nuclei. Here, in the last mentioned form, was a cell that could not be differentiated from the transitional leucocyte of Ehrlich, which according to recent investigators originates from endothelium. In addition to this all intermediate forms beween it and the small, mononuclear lymphoid cell with deeply staining nucleus, could be found, including the larger lymphoid cell and the large mononuclear, the latter with a relatively considerable amount of protoplasm. This would seem to be in confirmation of Ehrlich's teaching that these forms all represent different stages in the development of the same cell. Small forms with indented nuclei were also observed, and some of the spaces contained cells that were at first supposed to be polymorphonuclear leucocytes, but which were later regarded as hyaline and lymphoid cells with rapidly proliferating nuclei, for the reason that these nuclei were almost always double, very rarely triple, and seldom or never irregular like those of the typical polymorphonuclear leucocytes. They also stained with less intensity.

It was extremely interesting to observe that these small lymphoid cells, with single or double nuclei staining brightly with hæmatoxylin, were found, not only in the dilated tubular spaces in considerable numbers, but also throughout the solid portions of the growth, where they were packed in between the larger cells with vesicular nuclei. All intermediate forms between these and the large, hyper-developed, endothelial cells could be found with ease in various parts of the section and all varieties of these cells were found here and there in stages of active proliferation, having double, multiple or budding nuclei. These appearances justified the conclusion that all of the cells described were proliferated from the endothelium. No red blood cells were found within any of the tubular spaces.

The presence of cells indistinguishable from large and small lymphocytes and large and small transitional forms, in this structure, pointed strongly to endothelium as the progenitor, in part at least, of these varieties of leucocytes, the more so since the hyaline forms are said to occur in large numbers in the fluid in the cerebro-spinal and serous cavities, which are lined with endothelium. This is also another point in favor of the connective tissue origin of the tumor under consideration.

Where the columnar cells were found they were always ranged side by side, and were not detached; this indicates that these forms result, in all probability, from lateral compression.

In addition to the cells above described, many of the spaces contained a structureless, unorganized, finely granular material, the coagulated albumen of the lymph that circulates within them.

Small psammomatous bodies occurred occasionally throughout the section. They were not conspicuous, but were easily found when searched for. This also pointed to the connective tissue origin of the neoplasm. The tumor was not an infiltrating one; it was malignant only through the pressure resulting from its growth, as would be the case with a simple fibroma of the same size, in the same location.

Perhaps the term Lymphangiosarcoma would be the most accurate one to use in designating the character of this growth, but I have used the simpler one of Endothelioma as indicating more clearly its histogenesis.

The diagnosis was confirmed by Professor Wm. H. Welch, of the Johns Hopkins University, from whose note I quote the following:

> "I would of course call it an endothelioma, but it makes one sympathize with the growing disposition to make no distinction between endothelium and epithelium. It is an exquisite specimen."

The above reference by Professor Welch to the mooted question of distinguishing between endothelium and epithelium, opens up a wide field for discussion in connection with a subject upon which the most eminent authorities hold widely different views at the present moment, and into which I feel hardly qualified to enter. I have noticed, however, that in many of the most recent works on normal histology, the cells lining the blood and lymph vessels, serous cavities, etc., are designated epithelium, the term endothelium being ignored. It seems to me that the view taken by Piersol* is the best one, viz., that the endothelia are modified connective tissue cells, and the fact should not be lost sight of that the cells of epithelium and endothelium, though at times morphologically quite similar, are, in their essential vital properties, widely different. In tissues that are granulating after injury, proliferation of the endothelial cells and the formation of new connective tissue from them can be seen; and, conversely, the connective tissues are seen to develop into endothelium and new blood vessels, showing conclusively that they belong to the same group. On the other hand, epithelial cells are of an entirely different class, being permanently differentiated (in post-embryonic life) into passive, non-amoeboid, non-phagocytic, simple protective, or glandular cells, whose formative powers are of a very low order, in contradistinction to the endothelial cells, which possess reconstructive powers of a very high grade. These are plainly shown in Thoma's description of the organization of vascular thrombi, the result of studies undertaken by Heuking and himself. He there says:

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*Normal Histology, Piersol, 1896, pp. 115-116. He states: "The large serous cavities, as the peritoneal or pleural sacs, are in principle but greatly dilated lymph-spaces, lined by modified connective tissue cells, the endothelial plates, which by mutual pressure become polygonal in outline; instead of a few cells sufficing for the formation of a lining-membrane as in the case of the minute lymph space, innumerable elements are required to clothe the large serous cavity."

> "A better opportunity can hardly be found anywhere for investigating the pathological new formation of connective tissue in its relation to the new formation of capillaries. * * * * Starting from the spot at which the thrombus adheres to the vessel wall, a thin layer of endothelium next spreads over the thrombus. * * * * It soon invests the whole of the thrombus, while underneath it a zone of connective tissue develops. * * * * This formation of connective tissue underneath the endothelial investment of the thrombus appears as the result of the proliferation of this endothelium. The endothelial cells divide, the young newly-formed cells penetrate into the thrombus and secrete an intercellular substance. * * * * At the same time the thrombus mass becomes vascularized from the vasa vasorum on the one hand, and from the endothelial investment on the other. The endothelial investment of the thrombus sends processes downward into the thrombus which become transformed into capillaries. Connective tissue grows round the capillaries in the same manner as under the superficial investment of the thrombus, and forms an adventitia to them. This, however, increases in thickness, while the remains of the thrombus which lie between the newly-formed capillaries disappear, presumably by absorption. The great importance of the discovery consists in the fact that the new connective tissue represents a proliferation of the wall of the vessel, and that there is no transformation of emigrated white blood corpuscles into connective tissue, as was previously believed on the strength of Ziegler's researches."

Could one desire more conclusive evidence than this in support of the statement that simple squamous vascular endothelium can by its proliferation become transformed into new blood vessels and connective tissue? This is a property that epithelium never possesses after its primary differentiation in the embryo.

Such hard facts as these are difficult to reconcile with the classification of some anatomists and histologists (there are a few exceptions) who regard epithelium and endothelium as the same, evidently judging by the microscopical appearances of the cells alone, without regard to their special functions and vital properties.

In this connection I cite as a single example the following definition of squamous epithelium from a work on human anatomy, by Cleland and Mackay, 1896:

> "Squamous epithelium. To this order belong the linings of the heart and blood vessels, lymphatics, serous membranes, and the walls of spaces associated with the lymphatics in the

> connective tissues. They are usually now distinguished as endothelia, and while other epithelial cells are either epiblastic, hypoblastic or genito-urinary in origin, endothelium is mesoblastic in origin, and may be derived from the corpuscles in connective tissues."

Most pathologists, however, are as yet far from willing to admit that endothelium and epithelium are the same, for the reason that in pathological processes they possess quite different characteristics, while of vastly greater significance is the fact that in the normal state their functional characters are widely different. For example, in the lower forms of invertebrates, as the worms and metazoa, we find that the mesodermic cells, corresponding to our peritoneal endothelium, approach foreign bodies and engulf them, or, after surrounding them, fuse into a solid mass of nucleated protoplasm, secrete a digestive fluid, and in this way endeavor to destroy them. Do the epithelial cells perform such a function? No, for as Metchnikoff has shown, if, in the larval stage of the metazoa, the ectoderm be punctured through with a fine needle, its cells remain passive, while the mesodermic cells flock to the point of injury, surround the instrument, fuse together, and attempt to digest it. Soluble pigments may be precipitated from the fluids containing them, during their passage through the cells of epithelium, which never ingest solid foreign substances; on the other hand, the power of phagocytosis is a specific function of the cells of endothelium and a few others of the connective tissue group.

In connective tissue proliferations both in the granulomata and in neoplasms, we have the same tendency of the protoplasm to fuse, and, as in tubercle, leprosy and in the presence of foreign bodies, with a definite object in view, viz., the digestion and removal of the invading organisms or substances. This is clearly a functionating power that we do not find in the epithelial cell. The formation of giant cells from proliferating endothelium in a sarcoma of the jaw, as described by Thoma in his recent work on Pathology, is a phenomenon that one would almost never find in proliferating epithelium.

During acute inflammation the endothelial cells throw out pseudopodia and take up foreign bodies; it is well known that in malaria and some bacterial infections they act as phagocytes. In calcareous infiltration the connective tissue, and not the epithelial cells, are affected, though it is said that occasionally epithelium may show a similar change.

According to Ziegler and Thoma, where silver is absorbed through the intestine, as in argyria, the deposits occur, not in the epithelium, but in the connective tissue cells in the papillæ of the skin, in the glomeruli and medullary portions of the kidney, adventitia of the small vessels, connective tissue of the intestinal villi; in short wherever we find abundance of blood vessels and lymphatics, with their lining endothelium.

Surely this is sufficient evidence to show that there are certain vital, important, and positive points of differentiation between these two types of cells, which persist from the embryo, and which we cannot afford to overlook.

It may be said that in the cells lining the infundibula and alveoli of the lung we have epithelial cells that are phagocytic, for at times they take up considerable pigment. Rather, do we not have two kinds of cells in the alveoli, one the thin, flat epithelia, and the other smaller, resembling the endothelial cells of lymphatics or capillaries? It is to be noted that the bulk of the pigment taken up by the lung is deposited finally not in the wall of the alveolus, but in the connective tissue stroma of the organ, beneath the pleura, and about the vessels and bronchi, where we have the largest number of lymphatics with their lining endothelium. The alveolus of the lung is said to be lined by epithelial cells throughout, and the difference in size and appearance of these cells is explained by the statement that at birth, when air first gains access to the alveoli, most of the cells are stretched by the expansion of the saccules and become squamous, and that the other cells, being in excess of the number required to cover the inner surface of the distended alveoli, are not expanded at all, but retain their original size and form, remaining to fill the small interspaces between the larger flattened cells. I am of opinion that these smaller cells are not epithelial cells at all, but endothelial cells, situated in the stomata of the lymphatics, and that they are placed there for the special purpose of taking up and disposing of foreign objects of any kind, bacteria, blood pigment, coal dust, etc., thus performing a valuable office that the epithelial cells cannot do for themselves.

Phagocytosis is a function belonging to cells of the connective tissue group and not to epithelium, which seems to have been set apart generally for protective, filtering or specialized secreting purposes, but which never, after primary differentiation, possesses that vital mechanical activity of protoplasm represented by phagocytosis such as the endothelial cells so often manifest. It might be argued that these phagocytic cells in the alveoli of the lung are epithelial, and that the pigment they contain after hæmorrhages, for instance, is taken up in solution and precipitated by their protoplasm, as in the case of kidney epithelium. To this I reply that they may be seen to contain red blood cells which are intact, proving that they ingest them whole, like the blood-carrying cells of the spleen, which are universally acknowledged to be endothelial.

Now the walls of the alveoli show numerous stomata in the interspaces between their lining cells, and these stomata are the openings of lymphatics. These lymphatics, of course, contain endothelium; then why should not these endothelial cells project into the mouths of the stomata, guarding the openings, if I may so speak, and lying in wait for any intruder that may come within reach? In this connection wish to quote from Quain's Anatomy, Vol. III, Part IV, 1896:

> " * * * * But the air cells themselves, both those which are scattered over the respiratory bronchioles and those which cover the infundibula, as well as intermediate portions of the infundibula which occur here and there between the air cells, possess an epithelium of a peculiar character. The cells of this epithelium are of two kinds, viz., large, thin, very delicate cells, irregular in size and shape, lying over the blood vessels, but also, in many cases, extending over the interstices between them; and, (2) small, flat, polygonal, nucleated cells, which lie singly or in small groups of two or three cells, between the others, and always in the interstices of the capillary network. These are similar to the cells which are found in patches in the lobular bronchioles. If the lung is greatly distended they also become flattened out.
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> In the fœtus the lung is entirely lined with small granular pavement cells, but with the distension which follows upon the first respiratory efforts most of the cells become transformed into the large, thin, epithelial elements above described." Then speaking of the post-natal period, "* * * * A number of leucocytes, both granular and eosinophil, are usually to be found free in the air cells and smaller bronchial tubes; not unfrequently they contain carbonaceous particles. By the migration of these cells into the pulmonary tissue, the carbon particles may be conveyed into the substance of the lung and thence into the lymphatics and bronchial glands. * * * *
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> LYMPHATICS. The alveolar lymphatics of the lung take origin from lymphatic capillaries in the inter-alveolar septa, etc. * * * * The branched connective tissue corpuscles and cell spaces with which the lymphatics are in connection at their origin, send processes upward to the inner surface of the air tubes and alveoli between the epithelial cells (like the speudo-stomata of the serous membranes)."

The above statement regarding the variety of epithelium found i the alveoli of the fœtal lung is further supported by the followin taken from Clarkson's Text-book of Histology, 1896, p. 288. Speakin of the lung in the fœtus he says:

> "The epithelium lining the unexpanded air cells differs from that of the air cells of the mature lung in being also unexpanded, that is, it is composed of cubical glandular looking cells instead of flattened squames."

I do not think the above view is the correct one. The sudden, almo instantaneous, expansion of the protoplasm of a cell from a small cuboidal into a large squamous form, would not be in accordance with Nature's accustomed gradual, more certain, and safer method of transforming cells from one form to another. And then think of the ruptures, hæmorrhage, certainly the œdema that must ensue upon the sudden, violent elongation of the multitude of delicate capillary blood vessels in the alveolar walls, aggravated by the equally sudden distension of the vessels with the blood that must enter them for æration, aided by the suction power of the enormously distended thoracic cavity. It is certainly much more reasonable to suppose that the walls of the alveoli are fully developed with their squamous epithelium prior to birth; that the alveoli contain the fully developed capillary blood vessels, and are simply collapsed, their lateral walls lying in contact; that the organ has attained its full length, but the walls of the alveoli being in apposition, the breadth of the lung is very much less than that of the ærated lung, yet the organ is large enough to fill the unexpanded cavity within which it lies. That prior to birth as well as subsequently there are two varieties of cells upon the alveolar walls, one of these being epithelial and the other smaller connective tissue endothelial cells. In support of this view, and to show that the lungs fill the cavities in which they lie, I quote the following from the American Text-book of Physiology, 1896, p. 504:

> "Before birth the lungs are airless (atelectatic), the walls of the bronchioles and infundibula are in contact, yet in the child before birth, as in the adult, the lungs are in apposition with the thoracic walls, being separated only by the two layers of the pleura."

I would now invite attention to the following statement in the quotation already made from Quain's Anatomy:

> "LYMPHATICS.—The alveolar lymphatics of the lung take their origin from lymphatic capillaries in the alveolar septa. * * * * The branched connective tissue corpuscles and cell spaces with which the lymphatics are in connection at their origin, send processes upward to the inner surface of the air tubes and alveoli, between the epithelial cells (like the pseudo-stomata of the serous membranes)."

It is clear from the above that connective tissue corpuscles reach the inner surface of the alveolus at points between the epithelial cells, and that prolongations of the minute cell spaces with which the ultimate lymphatics communicate also reach the same spots; therefore no other conclusion can be drawn than that these cell spaces are the openings of the lymphatics upon the alveolar walls, guarded by processes of the connective tissue corpuscles. It is never claimed that more than two kinds of cells occur on the inner surfaces of the alveoli, and by again referring to the extract from

Quain's Anatomy it will be seen that one variety consists of "large, thin, very delicate cells, irregular in size and shape, lying chiefly over the blood vessels;" the other of "small, flat, polygonal nucleated cells, which lie singly or in groups of two or three cells, between the others, and always in the interstices of the capillary network." Hence it follows that the smaller cells described above are the connective tissue cells forming the lymph capillaries, which means also that they are endothelial cells, as also would be connective tissue cells occupying the same relation to blood capillaries. Endothelial cells are in their very nature amoeboid and actively phagocytic; therefore, I hold that these are the cells that take up foreign particles in the alveoli of the lungs and convey them into the lymphatics.

I take exception to the statement, "A number of leucocytes both granular and eosinophile, are usually to be found free in the air cells and smaller bronchial tubes, not infrequently they contain carbonaceous particles." Eosinophilic leucocytes, though actively amoeboid, are not phagocytic; they are said to be glandular cells whose secretion is discharged in the presence of bacteria, etc. If the granular cells are mononuclear, they are endothelial cells which have entered the alveolus, probably as a result of the proliferation of those already described in the alveolar walls, which are generally spoken of as "nucleated and granular cells" to distinguish them from the pale and often non-nucleated epithelium. This origin would explain their phagocytic properties, and the designation of these connective tissue cells as "leucocytes" would be only one more instance of a very common error. Should they be leucocytes of the wandering polymorphonuclear type, it would be hard to understand what chemiotactic influence had attracted them from the vessels in such number under normal conditions, for these cells are short-lived outside the vessels, and to maintain their presence there constantly continuous emigration is necessary. That they are connective tissue cells seems quite clear from the description given of them in Vol. II, Quain's Anatomy, 1882, American Edition, as follows:

> "A number of granular rounded amoeboid cells are usually to be found free in the air cells and smaller bronchial tubes; not infrequently they contain carbonaceous particles. By the migration of these cells into the pulmonary tissue, the carbon particles may be conveyed into the substance of the lung and thence into the lymphatics and bronchial glands."

Polymorphonuclear leucocytes, the wandering leucocytes of the blood, if poured out in sufficient numbers to remove pigment from the alveoli, would in cases of chronic passive congestion with haemorrhage, for instance, be required in such numbers as to constitute a purulent infiltration. The microscope shows that no such condition is present, and I can arrive at no other conclusion than that the pigment-carrying cells both in the alveoli and lymphatics are not leucocytes but swollen endothelial cells.

I freely acknowledge that if such a growth as the one under consideration projected into the bladder, I should unhesitatingly pronounce it a papillomatous adenoma, or adeno-carcinoma, as the case might be, because it is impossible to say in such circumstances whether a large cell with juicy protoplasm is derived from epithelium or connective tissue, judging from its appearance under the microscope alone. Fortunately for us, there is a tendency in new growths to the reproduction of the type of tissue from which they take their origin; then again it is exceptional for psammomatous bodies to occur (if indeed they ever do) in other than connective tissue cells, and in this case, the point of origin, age of the patient, envelopment of the growth by the pia mater, and the nature of the contents of the dilated spaces, made the diagnosis comparatively easy.

In closing I take pleasure in acknowledging my obligations to Professors Welch and Flexner of the Johns Hopkins University, the former of whom confirmed the diagnosis, while the latter reviewed the paper with me at the time it was first written.

HYDROLOGY OF THE CHAGRES RIVER.

By General Henry L. Abbot, U. S. A., Professor of Hydraulic Engineering.

Few better examples than the Panama Canal can be found to illustrate how great engineering works of the present day may demand elaborate investigation of physical phenomena, and the application of known laws and of refined methods of research before it is judicious to form plans and to enter upon actual construction.

Since the catastrophe of M. de Lesseps', to whom such information was lacking, the physics and hydraulics of the Chagres River have been under close study for sixteen years. The accumulated data are probably more complete than for any river of its size in the United States, and its tropical peculiarities of basin and climate while adding certain local difficulties eliminate important complications encountered in conducting such investigations in more temperate regions. For these reasons the stream possesses peculiar attractions for the student of river hydraulics.

Its basin is but little elevated above the sea, the bounding hills rarely exceeding a thousand or fifteen hundred feet in height, but the stream in its upper ramifications winds through gorges that favor a rapid delivery of the torrential downpours of the rainy season, lasting for eight or nine consecutive months of the year. Near the Atlantic coast the annual rainfall is about 140 inches, and in the interior about 100 inches; and rain may be expected on about 250 days in the year. The mean annual temperature is 80 degrees Fah. with no sensible variation from month to month. The soil containing much clay is chiefly composed of denuded tertiary deposits, with occasional veins and coulées of ancient irruptive material. The whole district beyond the few settlements is clothed with the luxuriant growth of the tropics so densely disposed as almost to defy passage. A river which serves to interpretate the hydraulics resulting from such conditions, and which is exempt from the troublesome complications caused by frost and by irregular rainfall certainly presents a fascinating and profitable subject for study.

The stream in the dry season of three or four months is clear, but in the rainy season it carries a moderate amount of sedimentary matter in suspension, less however, than might be supposed from the color of the water, for the material is fine and light; no delta has been formed at the mouth of the river. There are, however, deposits in favorable places in the channel, consisting chiefly of mud swept into the river by the sudden freshets; and some moving sand bars are occasionally encountered, especially in the upper river.

The effect on its regimen of the increasing declivity of the bed of the stream, as its course is followed up, is well marked. Near the coast the region traversed is so flat that even at Bohio, twenty-seven miles above the mouth, the water surface in the extreme low stage is only about a foot above mean tidal level at Colon where the tidal oscillation is about a foot and a half. At this stage a well marked tidal oscillation has been measured at Bohio of about two or three inches, being of the diurnal or single day type. The flatness of this lower district, of twenty-seven miles by the course of the stream, exerts a controlling influence upon the range of oscillation in times of flood. To gain the requisite head to carry the volume from Bohio to the sea, with no declivity in the bed to assist, the water piles up, so to speak, making the extreme range between high and low water (39.4 feet) at this locality greater than at any other on its entire course. In the next twenty miles, from Bohio to Gamboa, the bed rises about forty-five feet and this natural slope of about two and a half feet to the mile aids in restricting the flood range to about thirty-seven feet. Thence to Alhajuela, a distance of eleven miles, the bed rises forty-six feet more, which is too much for the flow at low stages, so that at such times eighteen or more rapids occur. In floods, this reserve supplies an effective motive power to carry forward the increased volume. No really great flood has been instrumentally gauged at Alhajuela, but measurements on very large freshets demonstrate that the extreme flood range can hardly exceed about eighteen or twenty feet. In this district the stream itself has registered its torrential character upon the channel. The bars, distinctly visible at low stages, differ widely in composition, some being of pure sand, others of pebbles, and others of rounded stones three or more inches in diameter; there is little or no mixing of materials. This sorting is attributable to the frequent freshets and occasional floods soon to be considered.

A short distance above Alhajuela the river forks, the principal branch, the Pequeni, heading near Porto Bello on the Atlantic coast. The other retaining the name Chagres heads more to the south in the Cordillera de San Blas. This upper district has been little explored, and is traversed only by a trail connecting the city of Panama with Porto Bello, and which is impassable or nearly so in the rainy season. The area is approximately 320 square miles, and has an annual rainfall of about 112 inches. It is drained by many streams following devious routes to one or the other of the two main forks. The annual outflow from this upper basin is about 2,000 cubic feet per second. In traversing the next basin, from Alhajuela to Gamboa, 130 miles in extent, where the annual rainfall is 98 inches, the river receives a joint contribution from fifteen affluents of about 550 cubic feet per second. Thence to Bohio it receives the drainage of 230 square miles where the annual rainfall averages 114 inches and the outflow from 17 tributaries is about 1075 cubic feet per second. These valuations of rainfall and outflow are based on the results of six years continuous and elaborate observations between 1897 and 1904. The average discharge of the river at Bohio measured during fourteen years is larger, in the ratio of 4,798 to 3.625 cubic feet per second, with a minimum of 3,384 in 1899. Indeed the Isthmus is subject to the recurrence of successive periods of increasing and diminishing rainfall covering several years; and the same is true for Nicaragua, although there appears to be no correllation between the two. Such differences in rainfall are of course reflected in the outflow. In as much as the number and duration of the freshets virtually determine the annual discharge, a study of periodic flow may be carried back several years before regular gaugings began, for the fluviograph was established at Gamboa in 1883. Records are lacking for 1889 and are incomplete for 1896 and 1897. Dividing the available eighteen years prior to the transfer of the property to the United States into periods of six years, we find that in the first period there were annually thirty-four freshets giving 455 hours above the lower limiting level (10 feet above low water), with a local rainfall of 102 inches. The second period showed twenty annual freshets, 214 hours, and 99 inches. The last period gave only eleven annual freshets, 93 hours and 88 inches. Subsequently, there have been in 1904 thirteen freshets, 94 hours and 84 inches; and in 1905 six freshets, 48 hours, and 82 inches. These indications are fully confirmed by the discharges actually measured at Bohio during the second and third of the above periods. For the second six years the average annual volume was 5,826 cubic feet per second, and for the third period 3,805 cubic feet; in 1904 it was 4,110 and in 1905 2,800 cubic feet. These records suggest that a minimum epoch is now passing, and that guided by usual experience we may expect soon to enter upon a period of increasing rainfall and river discharge. The first French company apparently labored under conditions differing but little from the probable maximum.

Below Bohio the hydraulic data are less full than above, as this district was of comparatively little importance in the solution of the problem of how to complete a canal already essentially completed as far as Bohio. The Chagres here receives two important affluents, the Trinidad with a basin of about 319 square miles, and the Gatuncillo with one of about 156 square miles, both having an annual rainfall of about 137 inches. The total basin of the river above Gatun is thus about 1,225 square miles in extent, with an annual outflow estimated at not less than 8,100 cubic feet per second; that in the three dry months being not less than 1,225 cubic feet.

But it is in the nature of its flow in the rainy season that the Chagres shows its most marked characteristics. As is always the case in the dry season, its usual character is that of a quiet stream oscillating slightly about a level raised only some four or five feet above the low water stage; but as indicated above it may be expected in its upper course to mount two or three times in a month, 10, 15 or 20 feet only to subside within twenty-four hours nearly to the same level as before, having in the process increased its volume from 2,000 or 3,000 to 20,000, 30,000, or even 50,000 cubic

feet per second. These sudden freshets are caused by downpours of
inch or more in twenty-four hours. When such cloud bursts cover t
entire basin and continue for several days they cause the so-called gre
floods, which have carried at Gamboa about 80,000 and at Bohio about 115,
000 cubic feet per second. Fortunately they are rare, only six having oc
curred in more than half a century. The freshets, however, are commo
and they sweep down the channel like great waves, their crests moving at
a velocity of about four and a half feet per second, that of the water it-
self in the upper course being some 12 feet, and at Bohio some 8 feet.

It is needless to say that an intelligent study of the canal problem has
demanded a precise knowledge of the fluctuating volumes carried by so
variable a stream. How was this knowledge to be obtained? While actual
gauging of the flow must constitute the basis of the estimations it was clear
that this method alone would fail to meet the needs of the case. Freshets
occurring in the night would largely escape measurement, although trials
with floats carrying lights were actually attempted by the engineers of the
Company. To secure a precise knowledge of the total flow of a stream
liable to such variations from moment to moment, would demand continu-
ous manipulation of the instruments for long periods. Hence dependence
must be placed on the automatic records of water level supplied by the
fluviographs, interpreted by rating tables so constructed as not only to rec-
ognize the varying phases of the flow but also to furnish a trustworthy
valuation of the volume which passed in the standard flood of 1879, the
greatest of record for half a century, and of which a knowledge of the
critical heights attained has been preserved. Evidently in framing such
rating tables the usual method of measuring the volume passing at a few
different stages, connecting the platted points by lines, and extending the
scale by judgment to the undetermined levels would not serve the purpose.

This river presents two fundamentally different conditions, one when the
flow is nearly constant and the volume is governed by the area of cross
section and the normal surface slope, largely influenced at each locality
by that of the bed; but during freshets the local slope at any given stand
must also be powerfully affected by the position of the crest of the wave,
increasing as it approaches and diminishing after its passage. Indeed it is
a well-known law of river hydraulics that in sudden rises the volume at
each level is excessive during the rise, diminishes as the maximum level is
attained, and becomes smaller during the fall.

In framing rating tables to meet these conditions the following method
was adopted. For each of the three important stations where fluviograph
records had been kept, the thousands of gaugings, covering a wide range
of water levels, were grouped accordingly and the general average at each
level was computed and platted. The law of increase of this mean curve
was studied and represented by an algebraic formula. The latter was then
adjusted to the observed values either by the method of least squares or
by equations of conditions compelling it tc pass through the largest pos-

sible number of points, so chosen as to make it conform closely throughout the entire range. By this method of framing the rating tables the volumes indicated at water levels beyond the limits of the actual gaugings were determined by the general law of the curve and not by an arbitrary extension determined by the judgment of the computer.

To meet the case of the violent freshets another refinement was necessary. All rivers under the exceptional slopes existing at such times carry volumes diverging from the general law of increase, and usually require different rating tables containing a function of the height at which the sudden rise began. Fortunately in the case of the Chagres the starting level is always found at so low a point that one freshet formula at each locality suffices. Very many gaugings taken at such times were available, and they were studied in the manner indicated above, to frame a formula to represent the median line between the rising and falling branches. By this method the rating tables representing the formula would give correctly the total volume passing during the entire freshet, although the volume indicated at any given level would be too small during the rise, and too large during the fall, but nearly correct at the highest point attained.

By this general method the daily discharge at Bohio, Gamboa and Alhajuela has been computed from the time when the property passed into the hands of the Receiver, and later from him to the New Company, and finally to the United States; and the same work is still continued under the Commission. To supply some early dates when fluviograph records were lacking, use has been made of the method by transfer. The relative volume carried at the three stations is an important and useful element in the hydrography of the river, and has received careful study. The ratios in the dry season vary but little from year to year, and the same is true in the rainy season; but there is a considerable change between the two seasons, as naturally would be expected. The value of all of them have been determined with small probable errors, from the large number of months available; and they permit a missing month to be supplied from the volume measured at the adjacent station, without much risk of inaccuracy. It is only at Alhajuela, however, where such interpolation has been used largely in completing the fourteen years' record of monthly discharges. The well established fact that the volume carried at Gamboa in the rainy months is only two-thirds of that passing Bohio, proved to be an important element in deciding the question of the type of canal; and this well illustrates the practical importance of such technical researches.

But perhaps the most interesting contribution to the science of river hydraulics resulting from the investigations accorded to this tropical river is in connection with the elaborate measurements of the ratio between downfall and outflow in the basin above Bohio. Such studies, of primary importance in connection with the water supply of cities, with works of irrigation, and with those for the generation of mechanical power, are usually handicapped in temperate regions by frost and snow in the winter.

and by irregularly distributed precipitation at all seasons of the year. At Panama frost is unknown, and the rainfall, regulated by the motion of the sun in declination and by the adjacent seas, is relatively subject to unvarying law. One of the important engineering problems of the canal demanded an elaborate study of this ratio, but the results have a wider application as throwing light upon the general question of what becomes of the water falling from the clouds.

This matters was studied in detail both for the basin above Bohio and for that above Gamboa, including as a check each of the three separate sub-basins into which the former is naturally subdivided. The general results based on the records of six consecutive years are the following. In the month of May, the end of the dry season, the normal value of the ratio is 0.3 with a probable error of 0.03 determined from 23 different measurements in the several basins. From this date its numerical value gradually and quite regularly increases until the month of November, when the sun is lingering near the winter solstice and the moisture-laden winds from the Caribbean sea are sweeping over the Isthmus so continuously as to cause the heaviest rainfall of the year. Its value is then about 0.8, and it rapidly increases above unity, reaching a fictitious value of two or three units in February, the driest month of the entire year. It then subsides rapidly, in March and April, to the annual minimum in May. The physical explanation of this variation is manifest. Upon the advent of the rainy season the earth gradually absorbs a part of the water falling from the clouds, thus preventing it from finding its way directly to the streams; but as time passes, and the earthern reservoir gradually fills, it discharges an increasing volume of ground water to augment the direct flow of the river. When the supply from the clouds ceases the reservoir is soon more or less exhausted by the continued flow of ground water, and the ratio reaches its minimum. In other words, the considerable outflow in the dry season, greatly exceeding the entire rainfall, is supplied mainly by ground water; and even in the rainy season especially near its terminus an important part of the river discharges percolates to it through the ground. It would seem probable that the average time of passage is about three months, and that if the length of the dry season were longer the flow might practically cease, as is now the case with the smaller affluents.

An analysis of the results of these researches indicates that of an average annual downfall of 111.5 inches, in this basin of 700 square miles, 73.4 inches found their way to the river either directly or through the ground, and that 38.1 inches disappeared by evaporation, by plant absorption, and possibly by deep penetration into the earth itself. Incidentally they confirmed the views of the geologists that there need be no fear of undue loss of water from the artificial lakes demanded for canal purposes; and confirmed the inference drawn from borings that there is a small flow of water through a permeable stratum existing near the bottom of the ancient gorge, about 160 feet deep, separating the bluffs between which the river flows at Bohio.

It is of interest to seek among American streams an example suited to illustrate how so great differences in fundamental conditions may combine to produce a river carrying similar volumes to the sea. The Roanoke River above Neal, North Carolina, is not unlike the Chagres above Bohio, from this point of view. Simultaneous gaugings made in 1896 at Neal and Bohio (the former by the Geological Survey) indicated for five consecutive months average discharges of 5,761 and 5,849 cubic feet per second respectively. Both basins are largely covered by forests in their upper courses and contain swamps in their lower districts, but the tropical growth is much the more dense. Both are subject to sudden floods, but those of the Roanoke cover several days while those of the Chagres rarely exceed a few hours. The low water discharge of the former is larger than that of the latter, being about 2,000 cubic feet per second to compare with 1,000; but the great floods of the Chagres are larger in the proportion of about 115,000 to 83,000 cubic feet per second. The extreme range of the Roanoke is about 30 feet, that of the Chagres being about 40 feet. The explanation of these different regimens is found in the respective areas of the basins, that of the Roanoke being about 8,717 square miles and that of the Chagres being 700 square miles; and in the respective annual precipitation, which is about 51 inches to compare with about 112 inches.

In the days of the contest over the proper route to select for the canal wild statements were made about the ungovernable floods of the Chagres. The truth is that they are less so than those of some of our own streams now under improvement. For example, the Warrior River and its affluent the Black Warrior, in Alabama, have shown at Tuscaloosa an oscillation of 67 feet with a rise of 20 feet in four hours. Such extremes have never been approached by the Chagres.

In conclusion it may be said that the dominating element in deciding what type of canal should be adopted at the Isthmus of Panama is neither more nor less than this excentric little river; and that the long years that have been devoted to its study have been well expended. They have made certainly known that all which is required is a judicious system of regulation by well understood engineering methods. Had this knowledge been available at the inauguration of the work under M. de Lesseps, hundreds of millions would have been saved.

PREVENTIVE MEDICINE.

By General George M. Sternberg, U. S. A., Professor of Preventive Medicine.

From the earliest times physicians have taken the lead in all that relates to the prevention of disease. In times of epidemic their advice is sought by afflicted communities and they have been instrumental in securing most of the legislation which has been enacted with a view to preventing or restricting the prevalence of infectious diseases. As members of boards of health, they are largely responsible for the enactment and execution of proper sanitary legislation, and as medical officers of the Army and Navy, they are charged with the duty of guarding the health of soldiers and sailors enlisted in the service of their country.

While the principal function of a physician engaged in civil practice is to give proper advice and treatment to the sick, he is constantly called upon to point out the most effectual methods of preventing the extension of infectious diseases in the homes of his patients; to indicate the proper diet and mode of life to be followed by convalescents and other members of families which he regularly attends, etc., All this he does cheerfully, although he rarely receives any compensation for advice of this kind and his professional income is diminished in direct proportion to his success in the prevention of disease among the families constituting his clientele.

The compensation for voluntary work in public or domestic sanitation is to be found in the consciousness of good accomplished and of high and humane motives worthy of the profession, and the willingness to perform such voluntary service is one of the most noteworthy distinctions between the educated and honorable physician and the ignorant and mercenary quacks who prey upon the community with no other object in view than that of gain. The beneficent results of preventive medicine are seen in the greatly reduced mortality rates in civilized countries generally, and especially in the fact that certain pestilential maladies which formerly prevailed as wide-spread and devastating epidemics, causing the death of hundreds of thousands of human beings annually, have to a great extent lost their deadly potency as a result of the progress of our knowledge with reference to their etiology and the best methods of combating them. Small-ox no longer claims its victims in any considerable numbers except communities where vaccination is neglected; cholera has been exded from our country during the last two widespread epidemics in Europe and its ravages have been greatly restricted in all civilized countries into which it has been introduced; the deadly plague of the seventeenth and eighteenth centuries is no longer known in Europe and the prevalence of typhus—so-called spotted or 'ship fever'—has been greatly limited. Typhoid fever, tuberculosis and dyphtheria are still with us and claim many victims, but we know the specific cause of each of these diseases; we know where to find the bacteria that cause them and the channels by which they gain access to the human body; and we know how to destroy them by disinfecting agents.

The mortality from tuberculosis is constantly diminishing in our large cities and the complete destruction of the infectious sputa of those suffering from pulmonary tuberculosis would no doubt go a long way towards the extermination of this fatal disease.

Perhaps the triumphs of preventive medicines can not be better illustrated than by a brief historical account of the prevalence of bubonic plague during the past three or four centuries. It can scarcely be doubted that the 'black death' of the fourteenth century was the same disease which subsequently prevailed in Europe under the name of 'the plague'—now more generally spoken of as 'bubonic plague. While modern methods of diagnosis have enabled us to recognize typhoid fever, typhus fever, relapsing fever and bubonic plague as distinct diseases, it must be remembered that up to the end of the fifteenth century no such differentiation had been made and the term 'pest' was applied to any fatal malady which prevailed as an epidemic, and no doubt in some instances included smallpox, which prior to the discovery of Jenner contributed largely to the general mortality of the population of Europe.

Bubonic plague continued to prevail in various parts of Europe at the end of the sixteenth century, and early in the seventeenth century (1603) an epidemic occurred in London which caused the death of 38,000 of its inhabitants. It continued to prevail in this city and in various parts of England, Holland and Germany and six years later caused a mortality of 11,785 in the city of London. During the year 1603 a most disastrous epidemic occurred in Egypt, which is said to have caused a mortality of at least a million. After an interval of ten or fifteen years, during which there was a marked diminution in the number of cases and the extent of its distribution in European countries, it again obtained wide prevalence during the year 1620 and subsequently, especially in Germany, Holland and England. The epidemic in the city of London in 1625 caused a mortality of more than 35,000. In 1630 a severe epidemic occurred in Milan, and in 1636 London again suffered a mortality of over 10,000, while the disease continued to claim numerous victims in other parts of England and on the continent. Later in the century (1656) some of the Italian cities ered devastating epidemics. The mortality in the city of Naples in the neighborhood of 300,000, in Genoa 60,000, in Rome 14,000. smaller mortality in the last-named city has been ascribed to the tary measures instituted by Cardinal Gastaldi. Up to this time rers, processionals, the firing of cannons, etc., had been the chief ince for the arrest of pestilence, with what success is shown by brief historical review thus far presented. But this enlightened ate inaugurated a method of combating the plague and other in- ious maladies which, with increasing knowledge and experience in use of scientific preventive measures, has given us the mastery of e pestilential diseases, and has been the principal factor in the nction of bubonic plague from the civilized countries of Europe. ıt it was long after the time of Cardinal Gastaldi before sanitary ıce was established upon a scientific basis and had acquired the idence of the educated classes. Indeed, the golden age of pre- ive medicine has but recently had its dawn, and sanitarians at the ent day often encounter great difficulty in convincing legislators the public generally of the importance of the measures which have ı proved to be adequate, when properly carried out, for the pre- ion of this and other infectious maladies.

'e have now arrived in our review at the perind of the 'great ue of London.' For some years this city had been almost if not rely free from the scourge, but in the spring of 1665 it again ap- red and within a few months caused a mortality of 68,596 in a ulation estimated at 460,000. This, however, does not fairly rep- nt the percentage of mortality among those exposed, for a large portion of the population flew from the city to escape infection. Ipon the continent the disease prevailed extensively, especially in stria, Hungary and Germany. The epidemic in Vienna in 1679 sed a mortality of 76,000. In 1681 the city of Prague lost 83,000 ts inhabitants. During the last quarter of this century the disease ippeared from some of the principle countries of Europe. Accord- to Hirsch it disappeared from England in 1679, from France in }, from Holland about the same time, from Germany 1683 and n Spain in 1681. In Italy it continued to prevail to some extent l the end of the century.

t the beginning of the eighteenth century bubonic plague pre- ed in Constantinople and at various points along the Danube; n here it extended in 1704 to Poland, and soon after to Silisia, ıuania, Germany and the Scandinavian countries. The mortality Stockholm was about 40,000 thousand. The disease also extended stward from Constantinople through Austria and Bohemia.

n 1720 Marseilles suffered a severe epidemic, probably as a result the introduction of cases on a ship from Leghorn. The mortality s estimated as being between 40,000 and 60,000. From Marseilles as a center it spread through the province of Provence, but did n invade other parts of France. In 1743 a severe outbreak occurred on t island of Sicily. A destructive but brief epidemic, which is estimated have caused a mortality of 300,000 occurred, during the years 17 and 1771 in Moldavia, Wallachia, Transylvania, Hungary and Pola At the same time the disease prevailed in Russia, and in 1771 caus the death of about one fourth of the population of the city of Mosc

Early in the nineteenth century (1802) bubonic plague appea at Constantinople and in Armenia. It had previously prevailed in Caucasus, from which province it extended into Russia. In 1808 1813 it extended from Constantinople to Odessa, to Smyrna and various localities in Transylvania. It also prevailed about the sa time in Bosnia and Dalmatia. In 1812 to 1814 it prevailed in Egy and, as usual, was conveyed from there to European countrie During the same year it prevailed extensively in Moldavia, Wallachi and Bessarabia. In 1831 it again prevailed as an epidemic in Consta tinople and various parts of Roumelia, and again it appeared in Da matia in 1840 and in Constantinople in 1841. Egypt, which for centu ries had been the principal focus from which plague had bee introduced into Europe, continued to suffer from the disease unt 1845 when it disappeared from that country.

The last appearance of oriental plague in Europe, until its recen introduction into Portugal, was the outbreak on the banks of th Volga in 1878-79.

The termination of an epidemic in the pre-sanitary period depended to a considerable extent upon the fact that those who suffered a mild attack acquired thereby an immunity; and that when the more susceptible individuals in a community had succumbed to the prevailing disease there was a necessary termination of the epidemic for want of material.

Another factor which no doubt has an important bearing upon the termination of epidemics is a change in the virulence of the germ as a result of various natural agencies. Time will not permit me to discuss this subject in its scientific and practical aspects, but the general fact may be stated that all known disease germs may vary greatly in their pathogenic virulence, and that in every infectious disease mild cases may occur, not only because of the slight susceptibility of the individual, but also because of the 'attenuated' virulence of the specific germ. In the eighteenth century, the beginning of sanitary science, isolation of the sick and seaboard quarantines came to the aid of these natural agencies, and did much in the way of arresting the progress of this pestilential disease. At the present day these measures, together with disinfection by heat or chemical agents, are relied upon by sanitarians with great confidence as being entirely adequate for the exclusion of this disease or for stamping it out if it should effect a lodgment in localities where an enlightened public sentiment permits the thorough execution of these preventive measures; but when the disease prevails among an ignorant population which strenuously objects to the carrying out of these measures, the contest between the sanitary officer and the deadly germ is an unequal one, and the stamping out of an epidemic becomes a task of great magnitude, if not entirely hopeless. This is illustrated by the experience of the English in their encounter with bubonic plague in their Indian Empire.

Plague seemed to be almost a thing of the past and no longer gave any uneasiness in the countries of Europe which had formerly suffered from its ravages, when in February, 1894, it made its appearance in the city of Canton, China, and three months later in Hong Kong. The disease is known to have been epidemic in the province of Yunnan, which is about 900 miles distant from Canton, since the year 1873, but it attracted little attention until the lives of Europeans living in the city of Hong Kong were threatened by the oubreak of an epidemic among the Chinese residents of that place. Many thousands of deaths occurred in Canton during the three months which elapsed after its introduction to that city before it effected a lodgment in Hong Kong.

Fortunately this outbreak gave the opportunity for competent bacteriologists to make scientific investigations relating to the specific cause of this scourge of the human race and to the demonstration that it is due to a minute bacillus. This discovery was first made by the Japanese bacteriologist, Kitasato, who had received his training in the laboratory of the famous Professor Robert Koch, of Berlin. This discovery was made in the month of June, 1894, in one of the hospitals established by the English officials in Hong Kong. About the same time the discovery was made, independently, by the French Bacteriologist, Yersin. From this time the study of the plague has been established upon a scientific basis and very material additions have been made to our knowledge with reference to the prevention and treatment of the disease.

That the plague bacillus has not lost any of its original virulence is amply demonstrated by the high death-rate among those attacked, and we are justified in ascribing its restricted prevalence to the general improvement in sanitary conditions in civilized countries and to the well-directed efforts of public health officers in the various localities to which it has been introduced during recent years. In the Philippine Islands, where it prevailed to a considerable extent when our troops first took possession of the City of Manila and where the conditions among the natives are extremely favorable for its extension, it has been kept within reasonable bounds and, indeed, the latest reports indicate that it has been practically exterminated by the persistent efforts of the medical officers of our army, charged with the duty of protecting the public health in those Islands.

Bubonic plague, cholera and typhoid fever have long been classed as 'filth disease,' and in a certain sense this is correct, although we now know that the germs of these diseases not only are not generated by filth, but do not multiply in accumulations of filth. They are present, however, in the alvine discharges of the sick, and when this kind of filth is exposed in the vicinity of human habitations or gains access to wells or streams, the water of which is used for drinking, the germs are likely to be conveyed to the alimentary canals of susceptible individuals, and thus the disease is propagated. Until recently the attention of sanitarians was so firmly fixed upon the demonstrated transmission of cholera and typhoid fever through the agency of contaminated water or milk that certain other modes of transmission were overlooked, or at least underrated. I refer to the transmission by insects, or as dust by currents of air. I have for many years insisted upon the part played by flies as carriers of infectious material from moist masses of excreta from cases of cholera and typhoid fever. There is good reason to believe that the bacillus of bubonic plague may be transmitted in the same way. The cholera spirillum is quickly killed by desiccation and this disease is probably very rarely, if ever, communicated through the medium of dust. But the germs of typhoid fever and of bubonic plague are more resistent and, without doubt, under certain circumstances, these diseases are extensively propagated by means of dust containing desiccated excreta. There is a good reason to believe that in several of our camps, during the Spanish-American War, this was an important factor in the etiology of typhoid fever epidemics. The average mortality from typhoid fever in our regular army since the Civil War has been, for the first decade (1868-1877), 95 per 100,000 of mean strength; for the second decade (1878-1887), 108 per 100,000, for the third decade (1888-97) 55 per 100,000. This latter rate compares favorably with that of many of our principal cities; for example, it is exceeded by the typhoid death-rate of the city of Washington, which is 78.1 per 100,000 (average of 10 years, 1888-1897, by that of the city of Chicago, which is 64.4 per 100,000; by that of Pittsburgh, which is 88 per 100,000. As a result of insanitary conditions existing in the camps in which our troops were hastily assembled at the outset of the Spanish-American War, the typhoid death-rate in our army of volunteers and regulars during the year ending April 30, 1899, was more than 22 times as great as it had been in our regular army during the decade immediately preceding the war period. As compared with the Civil War, however, there was a decided improvement, the typhoid mortality for the first year of the Civil War having been 1,971 per 100,000 of mean strength and for the Spanish-American War 1,237 per 100,000.

Experience shows that new levies of troops are especially subject to typhoid fever and other infectious 'camp diseases,' not only because of lack of discipline and consequent difficulty in the enforcement of sanitary regulations, but also because the individual soldiers are very susceptible to infection, owing to their age, the abrupt change in their mode of life, the exposure and fatigue incident to camp life, and last, but not least, their own imprudence as regards eating, drinking, exercise, etc. In the absence of sewers or other adequate means of removing excreta, the camp site is likely to become infected by the discharges of unrecognized cases of typhoid and typhoid bacilli are carried by flies to the kitchens and mess-tents and deposited upon food, or as dust are directly deposited upon the mucous membranes of the respiratory passages of those living in the infected camp. That preventive medicine has still serious work before it is shown by the fact that according to the last census return there were 35,379 deaths from typhoid fever in the United States during the census year 1900. The increase in mortality over the number in 1890 (27,056) is out of proportion to the increase in population, notwithstanding the general improvement in the sanitary condition of towns and cities. This is no doubt due to the continued pollution of water supplies and to the extension of this infectious disease in rural districts. It is in fact now an endemic disease in nearly all parts of the United States.

According to the census report of 1900, there were 111,000 deaths from tuberculosis during the year 1900. This does not, however, include the deaths in certain states in which the vital statistics are incomplete or unreliable, and it is probable that there are at least 145,000 victims of the great white plague annually within the limits of the United States. The last census return in those states where registration was approximately correct, including a population of about 21,000,000 people, shows that 12 per cent. of all deaths resulted from pulmonary tuberculosis, 8.5 per cent. from pneumonia, 3 per cent. from typhoid fever and 3 per cent. from dyphtheria and croup. These figures indicate to some extent the task which preventive medicine has still to accomplish.

A most interesting and notable example of the beneficent results following the practical application of sanitary measures based upon exact knowledge relating to the etiology of an infectious disease is afforded by the recent extinction of yellow fever in the city of Havana, which for many years had been the principal focus of infection in the West Indies, and the port from which it has been repeatedly carried to the seaport cities of the United States. During the first sixty years of the past century, yellow fever prevailed almost annually in one or more of the southern seaports of the United States and not

infrequently it extended its ravages to the interior towns in one
more of the southern states. So frequently did it prevail during
summer months in New Orleans and Charleston that the perman
residents of those cities commonly regarded it as a disease of the
mate and a necessary evil which it was folly to attempt to com
by quarantine restrictions.

In the great epidemic of 1853, yellow fever prevailed extensively
the states of Florida, Alabama, Louisiana, Mississippi, Arkansas
Texas. The epidemic of 1867 was limited to the states of Louisi
and Texas. Those states again suffered severely in 1873 and the sta
of Florida, Alabama and Mississippi were also invaded. A still m
extended and deadly epidemic occurred in 1878, causing a mortal
of 15,934 out of a total number of cases exceeding 74,000. In t
epidemic the disease followed the Mississippi River to the very subu
of St. Louis, and the state of Tennessee suffered severely as well as
states south of it. The city of Memphis alone had a mortality from
disease of about 5,000. These repeated epidemics not only cost
lives of thousands of citizens and paralyzed business of all kinds duri
their prevalence, but apprehension with reference to the recurrence
the disease very materially interfered with the growth of many sou
ern cities and retarded greatly the development of those portions of
country most liable to invasion. All this is now changed; public heal
officials are no longer filled with apprehension upon the approach
summer by the thought that any ship arriving from Havana m
introduce the deadly pestilence to our shores; commerce is no long
subjected to the serious restrictions formerly considered necessary
the exclusion of the disease; and the public generally have been m
aware that the fangs of this threatening monster have been drawn
the scientific demonstration of its mode of attack and the simple me
ures which have been proved to be effective in preventing its propa
tion. Until the recent demonstration of the transmission of yell
fever by mosquitoes, this disease was generally regarded as one of
filth diseases, although there were many facts opposed to this vi
In the light of our present knowledge we can no longer class it w
typhoid fever, cholera, bubonic plague and dysentery, in which disea
the germ is known to be present in the alvine discharges of the
and which are, consequently, well named filth diseases.

We now see clearly, however, why in certain particulars relating
its etiology it resembles the malarial fevers. It is limited as reg
its prevalence to comparatively warm latitudes or to the sum
months in more temperate regions and is dependent, to a certain
tent, upon rainfall or the proximity of standing water, because th
conditions are necessary for the propagation of mosquitoes. As
gards the filth diseases, properly so-called, no single agency is m
important for their prevention than the use of properly construc

ewers for the reception of excreta and its removal from the vicinity f human habitation. Sewers had come into use and had the warm ndorsement of sanitarians long before the discovery of the germs of e infectious maladies under discussion, and before it was positively nown that the infectious agent in these diseases is contained in the ischarges from the bowels. But now that we have an exact knowldge of the etiology of these diseases, the reason for the beneficent esults attending the use of sewers, in connction with an ample and ure water supply, is apparent. It may be safely asserted that a city r town having a complete and satisfactory sewer system and a pure ater supply is practically immune from epidemics of cholera or tyhoid fever, provided, of course, that the sewers are used for the purose for which they are intended, and that streets and back yards no nger serve as receptacles for filth, as was usual during the presanitary eriod even in great cities like London and Paris. The axiom 'tout l'égout' now governs the practice not only in Paris, but wherever he fundamental principles of municipal sanitation are understood and ewers have been constructed. Unfortunately, the cost of sewer contruction, the reluctance of tax-payers to part with their money and he ignorance or indifference of municipal authorities have conspired o prevent the accomplishment of this fundamental sanitary measure very many towns in the United States, and our endemic plague—yphoid fever—continues to claim a large annual quota of victims in uch localities. Even in the national capital our sewer system is inomplete and in many out-of-the-way places, especially in the densely opulated alleys of the city, shallow box privies are in use as recepacles for human excreta and the typhoid fever rate, owing to this and ther causes, is disgracefully high.

Mortality rates in towns and cities throughout the civilized world epend to a large extent upon the purity of the water-supply and the fficiency of the system of sewerage disposal; and the constant imrovement which is shown by the mortality statistics of England and ther countries which have made the most progress in this direction undoubtedly largely due to these two factors. This is well illusrated by the mortality statistics of armies. In the German army the nnual death-rate in 1868 was 6.9 per thousand, a decade later it was .82, in 1888 it had fallen to 3.24 and in 1896 to 2.6. In our own army, he death-rate during the period of peace just prior to the Mexican Var (1848) was about three and one half times as great as during the ve years preceding our recent war with Spain, and since the year 1827 here has been a diminution of the death-rate of nearly forty per cent. n the British army at home stations the mortality rate during the lecade ending in 1884 was 7.2 per thousand, in 1889 the rate had allen to 4.57 and in 1897 to 3.42. In the Italian army there has been gradual and progressive reduction from 13.3 per thousand in 1875 to 4.2 in 1897. The mortality in the French army was a little ove 21 per thousand during the five years ending in 1825. In 1890 it ha fallen to 5.81. per thousand.

According to the best estimates the average of human life in th sixteenth century was somewhat less than twenty years. At th present time it is more than twice as long and during the past twenty five years the average duration of life has been lengthened about si years. During the first thirty-five years of the past century the vit statistics of the city of London showed a mortality of about 29 pe thousand. At the present time the mortality in that great city h been reduced to from 17 to 19 per thousand. Even more notab results have been obtained in many parts of the civilized world as result of increased knowledge and improved methods for the preve tion of infectious diseases and the general improvement in hygie conditions.

A STUDY OF THE TELLURIDES: THEIR FORMATION AND CHEMICAL PROPERTIES.*

By Cabell Whitehead, B.M., M.S.

The tellurium used in my work was obtained from the residues from the electrolytic refining of copper. These residues, technically known as "slimes," consist of the silver, gold, lead, arsenic, antimony, tellurium, and selenium or their compounds found in small amounts as impurities in the smelted copper, and which in the electrolytic refining process, collect in the bottom of the refining vat as a mud or slime. In the course of the separation from this slime of the silver and gold, most of the arsenic, antimony and lead are also slagged off or volatilized, and there remains a very hygroscopic mass which consists largely of alkaline tellurites and selenites, produced by the combination of the tellurium and selenium in the slime with the alkali nitrates added during the smelting operation.

Pure tellurium was obtained by reducing the mixture of tellurites and selenites to tellurium and selenium, and treating this product successively with small portions of nitric acid (20° B.) which had been previously saturated with chromic acid. The action is violent at first, and care should be taken not to add too much of the oxidizing mixture at one time. When the tellurium has all been oxidized to telluric acid, the solution is evaporated, nitric acid being added in large amount when the point of crystalization is reached. Telluric acid is insoluble in nitric acid, while selenic acid is readily soluble, and after the separation of the telluric acid by filtration, and its purification by washing and recrystallization, large flat hexagonal plates of great beauty and purity are formed, having the formula $H_2Te\,O_4\,2H_2O$. From this telluric acid the pure elementary tellurium may be reduced, or the telluric acid may be converted into tellurous oxide by heating to bright redness in a platinum dish, as expressed by the following equation:

$$H_2Te\,O_4,\ 2H_2O + heat = TeO_2 + O + 3H_2O.$$

and the oxide can then be converted into sodium telluride by fusion with pure carbonate of sodium and charcoal. Apparatus was so arranged that the sodium telluride could be dissolved, filtered, and recrystallized in an inert atmosphere of hydrogen or illuminating gas, this precaution being necessary on account of the fact that the alkali tellurides decompose on contact with air. Beautiful crystals of sodium telluride were produced by the method described, and from these pure tellurium was prepared by passing a current of air through the solution until all the sodium telluri had been decomposed. The precipitated tellurium was washed carefull and after drying was melted and cast into bars.

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Hydrogen Telluride.

Hydrogen telluride may be produced by digesting telluride of potassiu with hydrochloric acid, or by digesting the tellurides of iron or zinc in t same manner. Hydrogen telluride is also produced when tellurium is us as the negative electrode in the electrolysis of water.

I have found in the telluride of aluminum a convenient source of th gas, which is given off by the decomposition of the aluminum telluri with water, according to the reaction:

$$Al_2Te_3+6H_2O=Al_2(OH)_6+3H_2Te.$$

The decomposition of the aluminum telluride is complete, even in t cold, and a constant stream of gas may be obtained by regulating t water supply so that it falls upon the telluride, a drop at a time.

Alkali Tellurides.

In this group the tellurides of ammonium, sodium, potassium and lithiu were prepared. Ammonium telluride was prepared by passing hydroge telluride into concentrated ammonia solution, and also by the reaction b tween barium telluride and a saturated solution of ammonium sulphat The tellurides of sodium and potassium were prepared by fusing pure me allic tellurium with twice its weight of the carbonates of sodium or p tassium, and one-tenth its weight of charcoal. The telluride of lithiu was prepared in a similar manner. The tellurides of sodium, potassiu and lithium all behave very much alike, and all form purple solutions, i color much resembling that of permanganate of potash. The color of t solution of ammonium telluride is pink, in marked contrast to that of t other three tellurides just mentioned.

Tellurides of the Alkaline Earths.

These tellurides are obtained with greater difficulty than those of t alkalies, as they fuse at a much higher temperature, none of them fusi much below the melting point of gold, and some of them, such as calciu telluride and magnesium telluride not even melting at this high temper ture.

Magnesium telluride was prepared by melting tellurium under a cov of powdered charcoal, and thrusting successive portions of magnesium ri bon into the fused tellurium. When cold, the crucible is opened, and t magnesium telluride will be found as a grayish brown, almost black, si tered mass. It dissolves in water with a slight odor of telluretted hydr gen, and has the characteristic purple color of the soluble tellurides. While not as soluble as the alkaline tellurides, it decomposes more easily.

Calcium telluride was prepared by heating calcium carbide with tellurous oxide, the best proportions being one part of carbide to four or five of tellurous oxide. An explosion was expected to result from the reaction of the carbide with the tellurous oxide, but the only result observed was a flash, such as occurs when nitre is heated with carbon.

Barium telluride was prepared by heating together barium hydroxide and metallic tellurium in the presence of carbon. Strontium telluride was formed by heating for half an hour 20 grams of salycilate of strontium and 7.5 grams of oxide of tellurium, at a white heat. The tellurides of calcium, magnesium, barium and strontium are all decomposed by air, and by carbonic acid or any stronger acid, and by alcohol. In many respects they closely resemble the corresponding sulphur compounds.

Tellurides Insoluble in Water.

Aluminum telluride was prepared by melting aluminum, and then throwing in small pieces of tellurium from time to time. Previously aluminum telluride has always been prepared by heating a mixture of powdered aluminum with tellurium, the reaction being under these circumstances a very violent one. The method I used obviated this difficulty, and also produced the substance in greater purity, the molten aluminum telluride separating perfectly from the excess of aluminum in the crucible. Iron telluride was prepared by the heating together of one part of iron with two parts of tellurium. The resulting telluride is a fusible crystalline body, closely resembling the corresponding sulphide. Zinc telluride is produced when zinc and tellurium are brought together in the molten state. Cadmium telluride is similarly prepared, and so is also copper telluride. Chromium telluride was prepared by heating together chromium and tellurium. The resulting compound was infusible at ordinary furnace temperature, and was unaffected by acids.

Tellurides Found as Minerals.

Lead telluride (Altaite) silver telluride, (Hessite) and gold telluride (Sylvanite) were all produced in crystalline form, resembling the natural crystals. Lead telluride was prepared by melting tellurium with a large excess of lead, and then subjecting the ingot to electrolysis in a bath of lead acetate. The uncombined lead dissolved, leaving the cubes and octahedrons of altaite in the bath. Hessite was produced artificially by adding tellurium to molten silver, allowing it to cool slowly, and then subjecting the resulting alloy to electrolysis in a solution of silver nitrate to which a small amount of free nitric acid is added. Gold teluride was prepared by fusing together tellurium, gold and sodium telluride, and allowing the mass to cool slowly. The sodium telluride present is insufficient to form the double telluride with all the gold present. The melt was dissolved in water, in an inert atmosphere, and the residue washed and examined under the microscope. The gold telluride was seen as a crystalline mass, but no perfect crystals were formed.

When copper telluride was dissolved in a bath of molten lead, allowed to cool slowly, and electrolysed in a bath of lead acetate, some beautiful crystals were obtained. They resemble iron pyrites very closely, both in appearance and crystalline form, and analysis shows them to be a double telluride of copper and lead. No corresponding mineral is known.

In concluding this paper attention is called to the very interesting field for investigation opened by the method described of producing crystals of metallic compounds in a molten mass of the metal, and then removing the uncombined metal by electrolysis. There can be but little doubt that the sulphides, selenides and antimonides can also be produced by this method and a promising field for study is thus offered.

INVESTIGATION OF THE PHENOMENON OF DELIQUESCENCE AND OF THE CAPACITY OF SALTS TO ATTRACT WATER VAPOR.

By Charles Russell Ely, B.A., M.A.*

The earliest literature bearing upon the subject was found in the Alchemia of Andreas Libavius, published in 1595, in which considerable space is devoted to a description of deliquescence, but it is all of a qualitative character. The first experimental work appears to have been carried on by John Leslie in 1803. Various earths and stones were exposed to the atmosphere and the amount of water absorbed by each was noted. No definite chemical compounds, however, appear to have been employed. In 1812 there appeared in Annales de chimie, 82 (1) 171-177, a paper by Gay Lussac on an "Investigation concerning the deliquescence of substances." This important paper appears to have escaped the notice of later investigators. Full justice cannot be done it in the short space which can be given to its consideration in this abstract, but several important facts may be noted. Thus the desirability of exposing the salt under investigation to a saturated atmosphere is pointed out. Under these conditions many substances not previously considered to be deliquescent were found to possess this property to a marked degree. The necessity of recording changes in temperature is shown. Finally it is stated that the elevation of the boiling point of an aqueous solution, saturated with any salt at a given temperature, determines its relative attraction for water vapor at that temperature when exposed to an atmosphere saturated with moisture, as compared with other salts under similar conditions. No single salt solution was found to have a lower boiling point than water. The full data upon which Gay Lussac bases his conclusions are not given by him. In 1827, Brandes published in full, in Schweigger's J. 51, 433, the data for a considerable number of experiments performed by him, in an article entitled "Contribution to the Knowledge of the Relationship of Water to Salts." Twenty three salts, in an anhydrous state, were exposed under similar conditions to an atmosphere saturated with moisture and the gain in weight noted, after an exposure varying from 2 to 220 days. No statement is made concerning the purity of the salts employed, and the variations in temperature and pressure are not given.

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No further work appears to have been undertaken, of a quantitative nature at least, until 1884, when C. E. Munroe, gave in the Proc. A. A. A. S. 33, 179, the results of his investigations concerning the attraction for moisture possessed by calcium chloride and bleaching powder. Careful analyses were made of the material used and variations in temperature and pressure were recorded. Small portions of the substance employed were taken and an absorption of moisture was noted far greater than that given by Brandes. In 1897, H. W. Hake, as a result of experiments with 14 different salts and with sulphuric acid, exposed to an ordinary atmosphere, announced in the Proc. Chem. Soc. Lond. 13, 147, that he had found that deliquescent salts form definite hydrates under these conditions and he concludes that the phenomenon of deliquescence was due to this tendency. The work of the present writer and that of F. W. Smithers Am. Chem. J. 19, 227, 1897, alluded to below do not furnish any evidence in support of Dr. Hake's conclusions. It is, however, proper to state that his papers were given as preliminary notices and that the data from which he reasoned were not given in full. The paper by F. W. Smithers already referred to, shows that, in the case of a number of deliquescent chlorides and nitrates, no tendency to form definite hydrates could be detected, when the salts or their solutions were exposed to a somewhat moist atmosphere.

In the present investigation, two sets of experiments were carried on. In the first set a number of salts were exposed to an ordinary atmosphere within a large open hood. The atmosphere was kept from becoming dry by exposing dishes containing water within the hood. Each salt was placed in a shallow flat bottomed dish, of uniform surface, 3.8 cm. in diameter and about 1.5 cm. in height, made by cutting off the top of a glass beaker. The purity of each salt was determined qualitatively and the amount of anhydrous salt ascertained by analysis. Readings of the wet and dry bulb thermometer and barometer were taken every day, with a few exceptions, while salts, exposed to an ordinary atmosphere, were being investigated. In the second set of experiments the vessels containing the salts were exposed separately in four in., closed desiccators, the bottoms of which contained pure water. The salts exposed to an ordinary atmosphere were: calcium, barium, strontium, magnesium, zinc, cadmium, lithium, ammonium, sodium, potassium, ferric, cobaltous, nickelous and cupric chlorides; and lithium potassium and sodium nitrates. The salts exposed to an atmosphere saturated with moisture were those mentioned above and, in addition, the chlorides of caesium and rubidium; and the sulphates and carbonates of lithium, sodium and potassium. In the case of the compounds exposed under the hood the change in weight was observed for periods ranging from 10 to 28 days for most of the salts employed. In a few cases a final weighing was made after an exposure

f 58 days. The more deliquescent salts were observed daily while
eighings of the less deliquescent salts were made at intervals of
vo to five days. Calculations were made and tabulated showing
e number of molecules of water present for each molecule of the
nhydrous salt at each weighing. As a result of these calculations,
appeared that no tendency could be observed on the part of any
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ons for the purpose of comparison. Crystallized barium chloride was
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d gained a maximum weight of only .0059 gms. of water during a
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their previous record as to deliquescence under ordinary conditions.
tronium chloride was therefore taken together with another portion
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ium and ammonium were used.

The results of the above experiments were compared in various
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roup it was found that the curve for potassium chloride showed the
east absorption, sodium chloride giving a higher curve and ammo-
ium chloride a still higher one.

Magnesium chloride and calcium chloride were next compared and
hen the chlorides of lithium and sodium. These experiments showed
hat magnesium chloride absorbed vapor water more rapidly than cal-
ium chloride, and that lithium chloride was more deliquescent than
odium chloride. Comparing the chlorides of magnesium, zinc and

cadmium, it was found that the magnesium salt was the most deliquescent, the zinc salt next and the cadmium salt the least. Up to this point it had been observed that in any periodic group the attraction for water vapor shown by any salt varied inversely with the atomic weight of the metallic element. In taking up the chlorides of rubidium and caesium which were the next to be investigated, it was thought that the results obtained might differ from those previously secured. It was noted for example that in the literature caesium chloride was described by some authors as deliquescent and it was, therefore, hardly to be expected that it would show a rate of absorption less than that of sodium chloride, yet such proved to be the case. These salts behaved in the same way as those previously taken, sodium chloride attracting the most water, followed by rubidium chloride and then by caesium chloride.

A group consisting of $Co\ Cl_2$, $Ni\ Cl_2$, $Fe\ Cl_3$ and $Cu\ Cl_2$ was next studied and it was found that the order of their avidity for water vapor was $Co\ Cl_2$ first, $Ni\ Cl_2$ second, $Fe\ Cl_3$ third and $Cu\ Cl_2$ fourth. It will be noted that $Fe\ Cl_3$ does not follow the rule as observed up to this point. This was not unexpected for it was doubted whether the ferric salt was properly to be compared with the other salts mentioned, on account of its higher valency. $Fe\ Cl_2$ was not used on account of its tendency to become oxidized. On account of the instability of the compounds or the difficulty of obtaining a sufficient number of compounds belonging to a single group, to make a comparison of value, no other chlorides were examined.

In the next experiments using the nitrates and sulphates of lithium, sodium and potassium, it was shown that the order of attraction for water vapor was lithium salts first, sodium salts second and potassium salts third.

The carbonates of lithium, sodium and potassium were next selected on account of the low solubility of lithium carbonate and here for the first time the general rule found above did not hold, potassium carbonate showing the greatest absorption followed by sodium carbonate and with lithium carbonate taking up the least amount of water. It will be seen that in this case the rate of absorption varied directly with the atomic masses instead of inversely.

To check the results an empty dish was exposed under the same conditions to which the salts were subjected in the foregoing experiments and it showed an appreciable gain in weight. The amount of water deposited was, however, less than one one-hundredth of the weight of water absorbed by the least hygroscopic of the salts. In the earlier work no care was taken to weigh out equal portions of the compound employed, but it having become evident that the relative amount of water taken up in a given time would depend on the weight of the salt taken, a greater amount of any salt requiring a longer time of 58 days. The more deliquescent salts were observed daily while weighings of the less deliquescent salts were made at intervals of two to five days. Calculations were made and tabulated showing the number of molecules of water present for each molecule of the anhydrous salt at each weighing. As a result of these calculations, it appeared that no tendency could be observed on the part of any salt to form stable compounds, corresponding to definite hydrates, under the conditions of the experiments, as described above. This fails to corroborate the conclusions drawn by Dr. Hake from his investigation. Further than this no general conclusions were formed and individual behavior only could be noted.

The second set of experiments with the salts exposed to an atmosphere saturated with water vapor proved richer in results than was the case with the previous investigation. The first salt selected for examination was calcium chloride and at this point it was thought desirable to expose some salt not deliquescent under ordinary conditions for the purpose of comparison. Crystallized barium chloride was taken, since, in the first set of experiments, a portion of this salt had gained a maximum weight of only .0059 gms. of water during a period of 16 days as compared with a gain by an empty dish exposed under the same conditions, of .0018 gms. The barium chloride readily absorbed water vapor when exposed to a saturated atmosphere and finally dissolved completely in the water which it had thus attracted to itself, which accords with Gay Lussac's conclusions. It was therefore decided in the following experiments to select for observation similar salts belonging to the same periodic group without regard to their previous record as to deliquescence under ordinary conditions. Stronium chloride was therefore taken together with another portion of calcium chloride and following this the chlorides of sodium, potassium and ammonium were used.

The results of the above experiments were compared in various ways, and it was found that a certain regularity of behavior could be noted when the results were plotted in terms of the time of exposure and the amount of water attracted by a unit weight of each salt in the anhydrous condition. Setting forth the results in graphic form in this manner, it was seen that the curve of absorption of water vapor by $Sr\,Cl_2$ fell below that for $Ca\,Cl_2$. With the chlorides of the [illegible] group it was found that the curve for potassium chloride showed the least absorption, sodium chloride giving a higher curve and ammonium chloride a still higher one.

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The results obtained in this research indicate a relation between the osmotic pressure of salts in solution and the atttraction of such salt solutions for water vapor. In correlating the results of these experiments with those for osmotic pressure we may regard the air, saturated with moisture, as analagous to the semipermeable membrane employed in measuring osmotic pressures, water being able to pass through it in the form of vapor, while the salt from its nature, is unable to escape from the dish containing it. The number of molecules present in a definite weight of a given substance is equal to the total weight taken divided by the weight of one molecule. Therefore, the number of molecules present in the same weight of different salts will vary inversely as the moleculor weight of each salt, and where we have a series of salts which differ in composition only in one of the radicles in each salt, as for instance in the metallic radicle, the number of molecules present in each case when the same weight of each salt is taken, will vary inversely with the weight of the metallic radicle present. It would therefore appear from the results of this investigation that the rapidity of absorption of water vapor, for a considerable number of salts, varies with the number of molecules of each salt.

In an article in the Jour. Am. Chem. Soc. 21, 411-415, 1899 dealing with an investigation into the surface tension of solutions of lithium, sodium and potassium chlorides, C. E. Lineberger states that the surface tension of the aqueous solutions of these salts varies inversely as the molecular weights of these salts, and that equimolecular solutions have the same surface tensions. In considering the results obtained in this investigation it was thought at first, that the rate of absorption of water vapor might depend solely on the solubility of the substance employed, using this term in its ordinary sense. That this is not the case may be seen by the fact that such a soluble salt as $Cd\ Cl_2$ falls below $Na\ Cl$ in its rate of absorption, while $Zn\ Cl_2$ appears to be more soluble than $Mg\ Cl_2$ though its rate of absorption of water in an atmosphere saturated with moisture is less than that of the latter.

The chief results of the investigation would appear to be that

1. The rate of absorption of water by a salt in a saturated atmosphere does not depend on its solubility alone.

2. In a considerable number of similar salts, those belonging to a single periodic group show a rate of absorption of water by each salt that varies inversely with the atomic weight of the characteristic element. This has been experimentally demonstrated to hold true for all the members of the four groups of chlorides, one group of nitrates and one group of sulphates, which I have examined. It holds true also for the members of the same groups mentioned in F. W. Smither's

the opinion that it gained entrance to the plant by way of the root system, and consequently recommended applications to the soil; subsequently he suggested spraying with ammoniacal solution of copper carbonate.

The present investigations have been in progress for the past five years, careful studies having been made in the field, laboratory and greenhouse. Pure cultures of the parasites which have been found infesting the leaves and fruit have been made and their life histories and conditions of growth and distribution carefully studied.

The fungus causing scald and blast has been found to grow readily upon ordinary culture media, but grows best upon sterilized corn meal. There are two spore forms produced during its life history. The first, or pycnidial form produces ovoid, hyaline, pycnospores which are provided with a rather inconspicuous appendage consisting of granular matter which appears to be embedded in a somewhat gelatinous substance. Following the pycnidia, the mature ascigerous stage is frequently, though not always produced. The ascigerous perithecia occur much less frequently than the pycnidia, not only in pure cultures, but also upon the leaves of the cranberry. The perithecia are very similar to the pycnidia in external appearance. The asci are without paraphyses and contain eight hyaline or slightly yellowish ascospores. The fungus in both its pycnidial and ascigerous stages resembles very closely the black-rot fungus of the grape, *Guignardia Bidwellii.* This fungus is quite generally distributed throughout the cranberry-growing sections of this country. It occurs upon the leaves as well as the fruit. Specimens have been found in West Virginia, Massachusetts, Nova Scotia and Wisconsin. The fungus has the peculiarity of remaining for a considerable time in a dormant condition in the tissues of the leaves and fruit. After gaining entrance, the mycelium remains more or less inactive until the conditions of the host, or its environments, are such as to cause its further developement. Much of the decay which takes place in the fruit after picking is due to the development of this dormant or resting form of the fungus.

The disease known as anthracnose is caused by a species of *Gloeosporium* which is apparently very closely related to the forms which attack other fruits, and is regarded as only varietally separate from them. This disease is more prevalent in the northern sections of the cranberry growing area, having been found doing most damage in Massachusetts.

The fungus has been grown in pure cultures on various media, and the ascigerous, as well as the conidial form, has been produced. The conidia resemble very closely those of other species of *Gloeosporium* or *Glomerella*, as described by Stoneman, Clinton and others.

The ascigerous form, which has never before been found in this particular variety, is very similar to that which has been described by Stoneman, Sheldon and others from other fruits. The ascigerous stage has not been found under natural conditions either on leaves or fruit, but has been produced frequently on culture media in the laboratory.

Rot.—Cranberry rot affects the fruit in much the same manner as the scald. At first a small, light-colored spot occurs upon the berry. This spreads and the fruit is finally entirely softened and destroyed. Pure cultures from the mycelium in the interior of the berry are necessary in order to determine positively what fungus is responsible for the injury. The disease attacks the leaves also. It is caused by a fungus which, as previously mentioned, belongs to an undescribed genus, *Acanthorhynchus*. This disease is most frequent in New Jersey; it occurs also in West Virginia, Massachusetts and Nova Scotia. Numerous pure cultures of the fungus have been made on various media, but only the ascigerous form has been produced. The ascospores are rather large, yellowish-brown, and are expelled at maturity with considerable force. This aids in their distribution. Upon germination they produce a peculiar appressorium which attaches itself to the surface of the leaf or fruit and acts as a holdfast while it germinates and sends a germ tube into the tissue.

Besides the three organisms already mentioned, which cause the most injury to the cranberry, about thirty other species have been found upon the leaves, fruit, or other portions of the cranberry plant; some of these are evidently parasitic in habit, while others are either facultative parasites or only saprophytes. These various species have been described and their habits and distribution given. Several of these fungi are undescribed species.

From studies of the life histories of the parasites and their methods of reproduction and distribution it has been possible to devise methods for the prevention or control of the diseases.

A series of careful experiments and tests with various fungicides has been conducted for several years. As a result it has been found that Bordeaux mixture is most effective. Besides liquid applications, dust sprays have also been used, but without any decided benefit. On experimental plats treated with Bordeaux mixture in 1904, according to actual counts made September 8th to 13th, of sound and diseased berries on 35 yard-square plats, representing the average sprayed and unsprayed areas, it was found that the greatest percentage of disease on any of the sprayed plats was 27.5 per cent as against 100 per cent, or a total destruction on the unsprayed plats. The minimum amount of disease on any sprayed plats was 13 per cent as against 89 per cent on the check plats. Under more favorable conditions and with a more thorough and satisfactory application of Bordeaux mixture in 1905, much better results were obtained. Plats sprayed five times, as follows: May 19, June 22, July 14, July 31 and August 15, showed by accurate counts of sound and diseased berries made on September 8, the following results: An average of only 6 per cent of rotten fruit was found on the sprayed plats, while there was a little more than 91 per cent found on the unsprayed plats.

Two other plats sprayed the same number of times, but the first application being made on June 2 instead of May 19, showed as a result an the opinion that it gained entrance to the plant by way of the root system, and consequently recommended applications to the soil; subsequently he suggested spraying with ammoniacal solution of copper carbonate.

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He now attached an air pump, constructed on the principle of Sprengel's mercury pump, by means of a rubber tube to a narrow glass tube, open at both ends and passing through one of the two perforations of a cork fitted into the flask, while through the other perforation of the cork was passed the neck of the glass funnel containing the platinum foil funnel and the filter paper.

The connections being made and the pump started, the clear supernatant fluid was first poured upon the paper, the filtrate running through in a continuous stream, often very rapidly. The liquid containing the precipitate was now poured on, being careful to keep the filter as full as posssible during the operation. After the precipitate had all been transferred to the filter, it was washed thoroughly by carefully pouring water down the sides of the funnel to within a centimeter above the rim of the filter.

The filter, after the water had been allowed to drain, dried rather quickly, due to the high pressure to which it had been subjected, and could be ignited immediately.

In 1867 Dr. Gibbs described a filter make by choking the throat of a funnel first with coarse fragments of glass, and then placing upon these successive layers of powdered glass or sand, the upper layer being of the finest powder. Most precipitates could be filtered upon this filter without the slightest loss, and be dried with the funnel at any temperature below that at which glass softens, or the precipitates underwent chemical change. This filter could also be used for filtering corrosive substances.

Dr. Gibbs is one of the first chemists to consider the value of the purity of the precipitate, as well as of the filtrate, in separating the two and by the method he described the solid material upon the filter, by being dissolved in some appropriate solvent which would be without chemical action on the pulverized glass, is obtained in perfectly pure form, and entirely uncontaminated by any substance derived from the filtering medium.

The application of Bunsen's method of rapid filtration by means of an air pump, in conjunction with the use of the pulverized glass filters of Dr. Gibbs, marked a great advance in the methods of filtration, and modification of the Gibbs' filter by Munroe, and by Gooch, have brought to their present perfection the methods of filtration.

Munroe devised, in 1871, an improvement in filtration through the use of porous cones of earthenware, and in the course of this work he invented the rubber gasket now in general use for holding crucible filters during the process of forming the filter medium in them, and of filtering with them by means of the air pump.

The improvement effected by Gooch was first described in 1878, and consisted in the use of a platinum crucible, the bottom of which had been perforated by many fine holes, in place of a funnel, and in the use of a com-

A STUDY IN FILTRATION, WITH TESTS OF METALLIC FELT FILTERS.*

By Martha Maria Brewer, B.S.

Filtration as usually carried out is the separating of a solid insoluble substance from the liquid in which it is suspended. This can be done by means of a porous medium, or filter, of such material as not to be attacked by the substance to be filtered, and which is sufficiently porous to allow the liquid to pass through it, while coarse enough to retain all solid matter. Many different filtering mediums have been used, such as linen, woolen, and cotton fabrics, felt cloths, straw, raw cotton, coarse and fine sand, burnt clay, animal and vegetable charcoal, soft leather, unsized paper, crushed glass, sand, asbestos, and platinum sponge.

As early as 400 B. C., Plato mentions filtering by capillary syphoning, and Aristotle makes mention of water passing through earthen vessels not well baked. Geber, in the ninth century, Rhazes, in the tenth century, and Lulli and Aquinas, in the thirteenth century, all employed filtration in their alchemistic experiments, their method being to hang one end of a felt or woolen cloth in the vessel containing the liquid, and allowing the other end to hang in a vessel placed lower than the first, the liquid then passing through the cloth syphon by capillarity and falling drop by drop into the lower vessel.

Filtering through paper is mentioned by Libavius, in 1595, in his "Alchymia" (sometimes spoken of as the first text-book in Chemistry), and Juncher in a work entitled "Conspectus Chemiae," published in 1730, speaks of filtering through bibulous paper held in a glass funnel. But little improvement in this simple method of filtration was effected until 1858, when Dr. Julius Lowe described a filter using asbestos as the filtering medium, and which could be used in filtering gelatinous and corrosive liquids. In 1860 Professor Böttger employed gun cotton in filtering liquids which would act chemically upon a paper filter.

In 1869 Bunsen devised the method of filtration by means of suction, which was proved of incalculable help in chemical procedure. In an ordinary glass funnel of an angle of 60°, whose walls were free from inequalities, he fitted perfectly a thin platinum foil funnel, upon which was placed the ordinary filter paper. This he moistened and adjusted so that there distance from the crucible. Before the final ignition over the Bunsen flame I gently pressed down the edges of the salt with a rounded glass rod, thus causing the resulting sponge to adhere more tightly to the sides of the crucible and lessening the probable curling of the edge. Igniting gradually, the volatile constituents were driven off, leaving a coherent layer of metallic platinum. With care in preparation, no cracks will appear, but when they do they may be closed by gently rubbing with a glass rod, or by adding a new portion of ammonium platinic chloride and repeating the drying and ignition.

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*Abstract of a thesis presented to the Faculty of the School of Graduate Studies, in part satisfaction of its requirements for the degree of Master of Science, 1901.

The filter is now ready for use. In using the filter I found its application very wide. All substances which do not form an alloy with platinum when ignited, and which are soluble either in alkalies, at the ordinary temperatures, or acids, aqua regia alone being excepted, can be filtered upon this filter. Substances that do form an alloy with platinum on ignition, such as lead when weighed as the sulphide, I find can be very accurately estimated as the carbonate by heating in the steam oven, without affecting the platinum sponge in the least. Silver chloride, heated in the steam oven, gave good results. Very fine precipitates, such as calcium oxalate and barium sulphate, were collected upon the filter without the filtrate even being cloudy the first time running through.

Tests of a practical character, through the use of this filter in the varied determinations of quantitative analysis, gave most excellent results. Among many analysis made to test the practical working of the filter, may be mentioned the following: Determination of calcium in calcite, first as calcium carbonate, and then as oxide, by ignition of the carbonate; determination of manganese in manganous sulphate as manganous pyrophosphate; determination of lead in lead oxalate as lead carbonate; determination of magnesium in magnesium sulphate as magnesium pyrophosphate; determination of iron present as an impurity in calcite; determination of silver in silver nitrate as silver chloride; determination of arsenic in arsenious acid as arsenic oxide; determination of copper in copper sulphate as copper oxide; determination of barium in barium carbonate as barium sulphate, etc., etc. No difficulty was experienced in completely collecting and holding even the most finely divided precipitates, and after each determination it was found easy to dissolve in some appropriate reagent the substance on the filter, leaving it ready, after drying and ignition, for further use. The use of these filters was found to answer admirably, in all these varied determinations, as simple and expeditious means for the collection and weighing of the precipitates formed, answering in an eminently satisfactory way all of the requirements of quantitative analysis.

pact layer of asbestos fibre as the filtering medium. In preparing this filter, white, silky, anhydrous asbestos is scraped to a fine, short down, then boiled in hydrochloric acid to remove all impurities, and washed thoroughly by decantation with water. Next, a platinum crucible of ordinary size of a broad, low pattern, has the bottom perforated with many fine holes. This crucible is placed in the opening of a Bunsen funnel, over which has been fitted a rubber gasket as devised by Munroe. This funnel, containing the crucible fitted air-tight, is connected with an air pump, and then prepared asbestos suspended in water is poured into the crucible. The water is drawn through the holes in the crucibles, leaving the asbestos deposited in a close, compact layer upon the perforated bottom, more asbestos being poured in until a layer of sufficient thickness is obtained. This improved method of filtration has proven of greatest value in analysis, and is quite generally adopted by chemists everywhere. Dr. Gooch has also described methods of filtration using napthalene, and other easily volatile substances, in place of asbestos.

In 1888 Dr. Charles E. Munroe described a modification and improvement of crucible filters, through the use of a felt or sponge of some reduced metal, as platinum, as the filtering medium, in the perforated bottom of a crucible. Using a platinum crucible and a felt of platinum sponge, this filter had many advantages over other forms of filters, in the excellence of platinum sponge as a filter medium, retaining very finely divided precipitates without loss, and the ease with which the precipitate can later be removed by appropriate solvents, the choice of solvents being wide, on account of the inert nature of platinum toward most reagents. This filter can be used over and over, and even such precipitates as barium sulphate can be retained with perfect success, and, after weighing, can be easily removed without in any way impairing the filter.

Tests of Metallic Felt Filters.

In making the filter I dissolved a small amount of platinum chloride in distilled water, and precipitated the platinum as ammonium platinic chloride in excess of ammonium chloride. I washed the precipitates thoroughly, first with water, and then with alcohol a number of times by decantation, being careful in the last washing to pour off as much of the alcohol as possible without losing the salt. Placing a Gooch crucible, previously cleaned and dried, upon several layers of bibulous paper, I pressed it down tightly with one hand and with the other quickly poured in the moist salt. I did not relax the pressure on the crucible until the alcohol had apparently been absorbed, leaving the precipitate dry upon the bottom. By this means I found, when I lifted the crucible from the paper, that not a particle of the salt had been lost by passing through the perforations.

In igniting the salt I took the precaution to dry it in the steam heater for a few minutes or over a very small Bunsen flame placed at some little distance from the crucible. Before the final ignition over the Bunsen flame I gently pressed down the edges of the salt with a rounded glass rod, thus causing the resulting sponge to adhere more tightly to the sides of the crucible and lessening the probable curling of the edge. Igniting gradually, the volatile constituents were driven off, leaving a coherent layer of metallic platinum. With care in preparation, no cracks will appear, but when they do they may be closed by gently rubbing with a glass rod, or by adding a new portion of ammonium platinic chloride and repeating the drying and ignition.

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A NEW AMERICAN MOSQUITO.

Clara S. Ludlow, B.Sc., M.Sc.[*]

Throughout the northern part of the United States and probably throughout the southern part of Canada is found a group of mosquitoes belonging to Theobald's *Grabhamia* in which, so far at least as the adults are concerned, some species run very closely together, the markings of the individuals in one species closely resembling those of another, so closely indeed that the line of division is not easily seen.

The common characteristic is the abdominal marking, which may be said to be light colored, with a pair of submedian dark spots on some—at times all—the segments. Here too, the individual variation in a given species is very great, as for example G. *Curriei* Coq., where these spots may occur as in the type, or on a couple less or on one or two more of the segments.

The forms which run most closely together have also banded legs, the banding including both sides of the joints on some if not all the legs, e. g. G. *Curriei* Coq. G. *lativitta* Coq. and the final hind tarsus is often light when seen from one direction and brown from another, so that it is just possible that *dorsalis Meigin.* may be found among them.

What the larval differences may be is only partly known, and the division into coast and inland species does not seem satisfactory, for specimens which cannot be distinguished from *lativittata* Coq. (originally taken on the Pacific coast) are taken in Wyoming where no salt water nor salt marshes exist, and taken in numbers that seem to preclude the idea of transportation. Other forms, evidently very intimately related to *Curriei,* Coq. possibly a smaller and much lighter variety of it, are taken further east, even on the Atlantic coast, and the ultimate placing of these is still to be worked out. It may be that larval differences will decide.

Grabhamia Spencerii Theobald, and *G. Spencerii var. Idahoensis* have unbanded legs, and lately there has been studied a form apparently new, from Fort Keogh, Montana, which has the legs basally banded only, but in no wise resembles *sollicitans.*

Grabhamia nigromaculis n. sp.

♀. Head very dark brown, almost black, covered with ochraceous broad curved scales on the vertex and occiput, a triangular spot of slender golden brown curved scales immediately laterad, followed by flat, white, then brown, lateral scales and light scales towards the ventral surface; white bristles and very slender, long scales projecting forward between the eyes, a heavy bunch of pale forked scales in the nape; antennae dark brown, verticels very dark brown and sparse, pubescence white, basal joint very dark brown with flat scales; palpi very dark brown; proboscis very dark brown with a tiny white spot (sometimes an indistinct white band) on the apical part of the proximal third of its length, a few white scales at the base, apex dark; eyes dark blue, red iridescence; clypeus very dark.

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[*] In candidature for the Ph.D., degree.

Thorax almost black; prothoracic lobes covered with long rather slender spatulate white scales and light bristles; mesothorax with a median third of slender curved golden brown scales, pale on the curved half, and the outer thirds with rather broader pale ochraceous scales; a bunch of pale bristles over the wing joint and a few dark ones near the "bare space;" scutellum very dark (black) with pale ochraceous slender curved scales and pale bristles; pleura very dark brown with white spindle shaped and long flat scales, and pale bristles; metanotum very dark brown.

Abdomen very dark, covered with very dark brown, practically black, and pale ochraceous scales, i. e., pale basal and very narrow apical bands, a median ochraceous stripe on most of the segments, white lateral spots and a few pale scales scattered in the dark submedian spots; the dark spots on the apical segments are much reduced so that these segments are mostly pale scaled. Ventor mostly pale scaled.

Legs: Coxae and trochanter dark, covered mostly with white scales, a few very dark ones and some dark bristles; femora ventrally light, dorsally speckled nearly evenly black and white, light towards the base, and almost black just proximal to the tiny apical light spot which very slightly includes both sides of the joint; tibiae much as femora, more distinctly dark towards the apex; metatarsi speckled, darker than the tibiae, and having a basal white band, very narrow in the fore leg; all the tarsal joints are dark and in the fore and mid legs the first and second tarsal joints have tiny basal white spots; in the hind legs all the tarsal joints are basally white banded, the band on the fourth joint very narrow. Ungues large and equal, both uniserrate.

Wings clear with dark brown and white scales, speckled; the ventral scales all white. First, submarginal cell a little longer than, and about half the width of the second posterior cell; *mid* and supernumerary cross veins meet and are about equal, posterior cross vein about the same length as, and its own length distant from mid. Halteres with light stem and dark knob.

Length. 8-8.5 mm.

Habitat. Fort Keogh, Montana, Fort Lincoln, N. D.

Taken. Fort Keogh, Sept. 1-8., July 12-27.

BIBLIOGRAPHICAL RECORD.

September 1, 1905, to December 1, 1906.

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SCIENTIFIC NOTES.

Dr. Theodore Gill, Professor of Zoölogy, has prepared an elaborate article entitled "Parental Care Among Fresh Water Fishes," for the Smithsonian Report for 1905. It is already in type but not yet in page form; it will constitute nearly 150 pages and include nearly a hundred figures. The author affirms:

"Many important details respecting the life histories and parental care of a large number of other fishes have been published from time to time and may be found in the publications of various societies or other periodicals, but such are closed books to most persons. Anyone who looks for information in the popular works on natural history of the day must inevitably be disappointed at the meagerness of the information given. Even in the voluminous German work, so well known as Brehm's Tierleben, the information is meager for almost all fishes, and especially meager for American forms. The sources of knowledge have not been discovered by the compilers of such works, but he who might judge from the paucity of data that no others could be found would be much deceived. To uncover some of the interesting details hidden in comparatively little known journals and other works is the object of the present article, which is devoted to the record of facts about the mating and breeding habits of some among many remarkable species. It is hoped that the information given may indicate points to be observed in the history and economy of other species, as well as of those already noticed. There is, indeed, an urgent call for corroboration and amplification of most of the histories given, as well as for discovery of the natural history of other species."

Professor Merrill's "Contributions to the History of American Geology," issued in April of this year has received many flattering notices of approval, both at home and abroad. We quote from personal letters:—"It is unique, and a veritable treasure house of well arranged facts concerning American geology and American geologists," "A complex and difficult subject has been handled with much skill and thoroughness, and all who are interested in American geologists and the work they have acomplished will be grateful for this presentation." Again, "Sir Archibald Geikie and the late Professor Zittel have already provided geologists with historical accounts of the growth of their subject, mainly from the European standpoint. In these 'Contributions' Mr. Merrill takes up the story from the American point of view, thereby filling a serious gap in a manner that will earn the gratitude of everyone interested in the science." (Nature, London, England, August 2) "This

Munroe has shown that high explosives act most violently along lines of vacancy. A cylinder of gun-cotton detonated upon a large mass of iron will produce a shallow and uniform depression. Take a similar cylinder and bore a hole through the center. Now explode this above the iron, and opposite the perforation a deep hole of substantially equal diameter will be found in the metal. In his experiments upon safes for the Treasury Department, Dr. Munroe attacked a safe of 28 inches cube, with walls made of steel and iron plates, reinforced on each edge, using several sticks of dynamite. The result was nil. Taking an equal number of sticks, he fastened them around a tin can, set the can on the safe, mouth downwards and fired the charge. A 3-inch hole was blown clean through to the interior. The expert explained this on the ground that the force of the explosive was exerted through the hollow space as through the bore of a gun.

"Dr. Munroe advocates thoroughly a national law regulating the use of high explosives. At present there is nothing of the sort and the mortality from this cause greatly exceeds that in England, where there is a general and rather liberal ordinance."

In recognition of the universal interest in the matter of pure food, we are glad to publish the following abstract bearing on the "Effect of Salicylic Acid as a Food Preservative on Digestion and Health," by H. W. Wiley, M.D., Ph.D., who is Professor of Agricultural Chemistry in the Faculty of Graduate Studies in this University, as well as Chief of the Bureau of Chemistry. This abstract is based upon the detailed report published as Bulletin 84 Part II, Bureau of Chemistry, U. S. Department of Agriculture, Influence of Food Preservatives and Artificial Colors on Digestion and Health, and Circular 31.

The increasing interest in the question of the purity of food products, especially evinced by the enactment of the food and drugs act, and the meat inspection amendment, makes it the more imperative that it should be possible to state with authority whether extraneous substances added to foods, such as food preservatives and artificial colors, are or are not "injurious substances added to foods." It is thought that the feeding experiments conducted by the Bureau of Chemistry, Department of Agriculture, afford such an authoritative answer. The twelve men who belonged to the table at which the salicylic acid was administered, for a period of thirty days, received amounts varying from O.2 grams to 2 grams per day, the total amount taken by each individual amounting to 10 grams. Every effort was made to render the conditions uniform, and a close check was kept on all possible changes by means of physical, chemical and microscopical examinations. The body weight and the effect produced on the nitrogenous elements of the urine were especially studied, the metabolism of nitrogen, phosphoric acid, sulphur, fat, and total solids being carefully studied and the body balance in each case determined. As the results of this study the following general conclusions have been reached:

There is a well developed tendency during the administration of salicylic acid to increase the store of phosphoric acid in the body, while in the case of nitrogen no marked effect is produced altho there is a slight tendency to increase the digestibility and absorption of the nitrogen ingested. The data as a whole shows very clearly that salicylic acid exerts an exciting influence upon the activities which take place in the alimentary canal, stimulating the organs to greater effort, and this stimulation leads at first to increased digestion and absorption of the foods which are introduced into the stomach. In the light of the data which are exhibited salicylic acid may be said to increase the solubility and absorption of the food in the alimentary canal so that larger parts of the nutrients taken into the stomach actually enter the circulation.

The data which show the effects just noted, however, also indicate that the general effect upon the system is depressing, in that the tissues are broken down more rapidly than they are built up, and thus the normal metabolic processes are interfered with in a harmful way. The administration of the salicylic acid is attended by a gradual decrease in the weight of the subjects, altho the quantity of food elements administered during the preservative and after periods is slightly increased, which fact, together with a greater degree of absorption of the food elements, should have resulted in a slight increase in weight. This increase in weight, however, does not occur, and the disturbing influences of the salicylic acid upon metabolism, altho not very great, are specifically demonstrated.

The final conclusion in this matter, therefore, is that the unenviable position which salicylic acid has heretofore held among preservatives, in being regarded as the most injurious of all, is perhaps to a certain extent undeserved. Like other ordinary preservatives, it is not one which can be classed as a poison in the usual sense of the word. When used as a medicine in many cases of derangement of health it is, like the other chemical preservatives, often highly beneficial when properly prescribed by a competent physician. It is, when used in the food, at first an apparent stimulant, increasing the solubility and absorption of the common food elements from the alimentary canal. It soon, however, loses its stimulating properties and becomes a depressant, tending to break down the tissues of the body more rapidly than they are built up. It disturbs the metabolic processes, in most cases producing conditions which are not normal and which apparently are not beneficial. It has a tendency to diminish the weight of the body and to produce a feeling of discomfort and *malaise* which, while not marked, is distinctly indicative of injury. In some cases these symptoms of *malaise* approach illness, and while not always diagnostic are sufficiently common to unmistakably point to the salicylic acid as their origin. It places upon the excretionary organs, especially the kidneys, an additional burden which they are not able to bear and which can not possibly result in any good, but on the contrary must necessarily, by thus increasing the burden of the kidneys, finally result in injury, tho perhaps with the use of very small quantities of the preservative these organs would continue to perform their functions for many years before finally breaking down.

Apart from the known physiological effect of the preservative there are general considerations which render its use inadvisable, and there appears to be no necessity for its use, as food can be preserved in unobjectionable ways without its aid. Its indiscriminate use would tend to carelessness in the quantities employed, thus increasing the dangers to which the consumer is subjected. Also its use in the preservation of foods tends to induce carelessness and indifference on the part of the manufacturer, as when a chemical antiseptic is employed many of the processes necessary to the proper selection, cleaning, and preservation of foods may be omitted. The addition of salicylic acid and salicylates to foods is therefore a process which is reprehensible in every respect and leads to injury to the consumer, which, tho in many cases not easily measured, must finally be productive of great harm.

UNIVERSITY APPOINTMENTS.

Lecturer in Electrical Engineering: ABRAHAM PRESS, B.S., A.M.I.E.E.

B.S., Cooper Institute, 1899, Assistant in Physics, Ibid., 1899-1900; Assistant Electrical Engineer, Siemens Bros. & Co., Ltd., England, 1902-1904; A.M.I.E.E., London, 1904; Chief Instructor Electrical Engineers Institute of Corr. Instruction, 1904-5; Electrical Engineer Bullock Elec. Mfg. Co., 1905-6.

Instructor in Greek and Latin: CHARLES B. NEWCOMER, Ph.D.

A.B., 1889, M.A., 1890, University of Nebraska; 1890-'91, Student Universities of Berlin and of Nancy, France; 1891-'93, Professor of Greek and Latin, Cotner University, Bethany, Nebr.; 1893-'95, Master in the Belmont School for Boys, Belmont, Cal.: 1895-'99, Student of Classical Philology and Archaeology, University of Berlin, Ph. D., Ibid., 1899; 1899-1901, Acting Asst. Professor of Latin, University of Missouri; 1901-'04, Professor of Greek, Drury College, Mo.; 1904-'05, member of the American School of Classical studies at Athens; since Sept. 1905, Instructor of Greek and Latin, University of Michigan. Member Phi Beta Kappa, American Philological Association, etc., etc.

Instructor in Mathematics: GEORGE ALBERT ROSS, A.M.

A. B., William Jewell College, 1893; Professor of Mathematics, Grand River College, Gallatin, Mo., 1893-95; President, Clarksburg College, Mo., 1895-96; Professor of Mathematics, Hardin College, Mexico, Mo., 1896-97; Graduate Student Columbian University, 1897-99; A. M., Ibid., 1898; Vice President and Professor of Mathematics, Hardin College, 1899-1906. Member of The American Mathematical Society.

Professor of Morbid Anatomy: ISAAC WRIGHT BLACKBURN, M.D.

M.D., University of Pennsylvania, 1882; Pathologist to Government Hospital for the Insane, since 1884; Lecturer on Pathology of Mental Diseases, Georgetown University, 1885-'86; Professor of Pathology, ibid., 1886; Professor of Pathology and Histology, ibid., 1889; Professor of Morbid Anatomy and Special Pathology, ibid., 1898;

Member of the American Medico-Psychological Association, Corresponding Member of the Philadelphia Pathological Society; Member of the American Association for the Advancement of Science, and other medical and scientific societies.

N. B. The academic record of Professor Blackburn is republished from the Oct. '06 Bulletin to correct the error in stating that he was lecturer, professor, etc., since 1885 in The George Washington instead of Georgetown University.

UNIVERSITY MISCELLANEA.

Dr. George P. Merrill, Professor of Geology, gave the presidential address before the 184th meeting of the Geological Society of Washington, held at the Cosmos Club on December 19, 1906. His theme was, "The Composition and Structure of Meteorites Compared with those of Terrestrial Rocks."

A second edition, revised and enlarged, of the Principles and Practise of Agricultural Analysis, by Dr. H. W. Wiley, Professor of Agricultural Chemistry, is in press (Chemical Publishing Company, Easton, Pa.), and Vol. I, on Soils, 636 pages, has just been issued.

Dr. N. Monroe Hopkins, Asst. Professor of Chemistry in charge of electrochemistry was appointed "Electrical Engineer" by the Secretary of the Navy December 19, 1905, and placed in charge of the engineering work involved in the consolidation of power plants at the various Navy Yards and Naval Stations throughout the United States Naval Service. This consolidation of power plants was authorized by a recent act of Congress.

Walter C. Clephane, Professor of Law, has recently been appointed by the Commissioners of the District of Columbia, one of the three delegates from the District to the conference of Commissioners on Uniform State Laws, a conference which is closely in touch with the American Bar Association. This follows a previous appointment by the District Commissioners as a delegate from the District of Columbia to the Congress on Uniform Divorce Legislation, a session of which was held in Philadelphia in November.

James Brown Scott, M.A., J.U.D., Professor of Law, is general editor of the American Case Book Series (West Publishing Company), which is to comprise thirty-two volumes. Professor Scott was elected Secretary of the American Society of International Law, recently organized, and has been selected as managing editor of the *American Journal of International Law.*

The last meeting of the New York Section of the Society of Chemical Industry was held at the Chemists' Club, 108 55th street, November 23. There was an informal discussion of "Denatured Alcohol" and an exhibition of it in operation. Professor Charles E. Munroe, head of the Department of Chemistry, Dr. H. W. Wiley, Professor of ltural Chemistry, and Dr. C. A. Crampton, M.D., 1884, of this sity took part in the discussion.

Joseph William Fell, B.S. (Trinity College) 1889, M.S (G. W. 97, died on December 15, at Saranac Lake, New York. Since tion from this university Mr. Fell has served as chemist at the N. Smokeless Powder Plant at Indian Head and on the Geological of North Carolina.

Alice B. McKelden, Ph.D. (A.B., G. W. U., 1899), addressed sociation of Teachers of Mathematics in the Middle States and nd, December 1, on "The Problems that Arise in the Teaching nentary Algebra."

joint meeting of the American Philological Association and the ological Institute of America will be held in the halls of this sity, January 2-5, 1907.

Department of Politics and Diplomacy of the George Washing- iversity, which was organized in 1898 in close affiliation with w Department, has recently been intrusted to the general n of Professor C. W. A. Veditz as acting dean. Professor is now engaged in the elaboration of a plan for the complete ization of the Department with graduate and under-graduate . These courses will resemble the courses offered in other ons in the Departments of Commerce and of Political Science. der-graduate course will retain the cultural courses usually re- of candidates for the bachelor's degree but with especial is upon work in history, economics, political science and public n the reorganization of the school the endeavor has been made bine the successful features of the School of Political Science bingen, Germany, of the School for Political Science in Paris, the Wharton School of Finance and Commerce of the Univer- Pennsylvania.

interesting to note that Columbia and Yale Universities have y combined in the organization of courses to prepare men for eign service as diplomats or consuls and that throughout the y several universities have recently created new Departments nomics and Political Science. Thus the University of Illinois rted a college for higher business education, the University of has inaugurated a similar enterprise and the Washington and iversity is now establishing a School of Commerce. The credit, r, for the first creation of a distinct department for the pur- preparing men for the public service belongs to the George

Washington University, inasmuch as the Department of Politics and Diplomacy was started here in 1898 and has already graduated 500 men.

A class of trained nurses was graduated December 19, from the School of Nurses of The George Washington University at the regular Wednesday noon Assembly held in Assembly Hall. This is the second section of the class of 1906. The first class was graduated last spring. Those who received their certificates were: Misses Edna May Henson, W. Va.; Rachel Christian Trimble, Va.; Rebecca H. Blue, W. Va.; Mary Elizabeth Stevens Hardy, Va.; Mary Elizabeth Morgan, Va., and Florence Estelle Miller, N. Y. The address on this occasion was made by Dr. Wm. A. White, Superintendent of the Government Hospital for the Insane. The graduating class received their certificates from Dr. Needham, President of the University. They were presented by Dr. Phillips as Superintendent of the Hospital.

This School of nurses was opened in the spring of 1903. The course comprises three years of instruction and nursing. Among those present on the platform were Miss Struble, Superintendent of Nurses, several of the head nurses, members of the Faculty of Medicine and a large representation from the faculties of the various departments.

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NUMBER 2

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The
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Bulletin

ALUMNI NUMBER

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June, 1907

VOL. VI
No. 2

The
George Washington University
Bulletin

JUNE, 1907

The George Washington University Movement

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PUBLISHED BY THE UNIVERSITY AT WASHINGTON, D. C., IN MARCH, JUNE, OCTOBER, AND DECEMBER

Entered October 6th, 1904, at Washington, D. C., as second-class matter
under Act of Congress of July 16th, 1894

GEORGE WASHINGTON'S DESIRE FOR A GREAT UNIVERSITY AT THE CAPITAL OF THE NATION.

"It has been my ardent wish to see a plan devised, on a liberal scale, which would have a tendency to spread systematic ideas through all parts of this rising empire, thereby to do away with local attachments and state prejudices, as far as the nature of things would, or indeed ought, to admit, from our national councils. Looking anxiously forward to the accomplishment of so desirable an object as this is (in my estimation), my mind has not been able to contemplate any plan more likely to effect the measure than the establishment of a university. . . ."

George Washington In His Last Will.

"The Federal City from its centrality and the advantages which in other respects it must have over any other place in the United States ought to be preferred as a proper site for such a university."

George Washington's Letter to Commissioners.

"And so on this birthday of the Father of His Country I leave with you this thought: George Washington the testator, the people of the United States the executor, the bequest a university, its domicile this District, its field of toil the Republic, the reach of its ever-increasing influence and glory the boundaries of space and time."

Mr. Justice Brewer's Address at the George Washington University Convocation, February 22, 1905.

"Therefore, the objects of this movement are, to establish The George Washington University upon a commanding site given by the people of the District, with ample endowment furnished by the private benefactions of the people of the whole country, and thus to create the great University Washington and his associates desired to see established in the National Capital."

Extract from Statement adopted by the Citizens' Committee, March 11, 1907.

The George Washington University
BULLETIN

VOL. VI JUNE, 1907 No. 2

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THE GEORGE WASHINGTON UNIVERSITY MOVEMENT.

To share in this great work—the realization of George Washington's desire for a great university at the Capital of the Nation—all good Americans are invited. It is our purpose to build up in Washington an institution worthy of the name it bears. The promoters and adherents of The George Washington University Movement ask YOU to help to this end.

INTERNAL DEVELOPMENT OF THE UNIVERSITY.

This Movement to establish The George Washington University as a great non-sectarian institution on a private foundation began four years ago with the revision of its charter by Act of Congress. Its genesis is found in the efforts successfully exerted by President Needham to merge as far as possible under one corporation the agencies and facilities for advanced intellectual training already existing in Washington. Under its new auspices the internal development of the university has been marked. The Board of Trustees has been strengthened and its national character emphasized by the addition of men eminent in the financial, scientific, and professional life of the Republic. Greater unity has been attained by the consolidation of departments. An enthusiastic University spirit has been aroused in faculty and students. About forty professors and instructors, graduates of leading American universities, have been added to the teaching staff. The purpose is manifest in councils and faculties to measure up to the highest university standards and ideals. Evening classes have been given up, regular lectures beginning at 9:30 a. m. and closing at 6:30 p. m. Students who give but part of their time to the University have to devote from one to three years longer to secure their degrees than regular students. The libraries of the various departments have been greatly enlarged. Scientific publication on the part of instructors and graduate students has been stimulated. Methods of teaching have been improved, and standards of admission have been raised. Tuition fees in all departments have been increased. The response of the public to these organic improvements has been noteworthy, as is seen in the enhanced prestige of the University and in an increase of over three hundred in the number of the students.

THE SITE FUND CAMPAIGN.

Though the new era in the history of the University began with the advent of the present administration, so modestly has President Needham done the work of reorganizing the University and planning its new career, that only within the past year has an earnest appeal been made to the public to come to our assistance financially. We have just begun to show to others the possibilities for advanced education in Washington through the development of our institution, and to call attention to the opportunities it affords for judicious educational investments. We have now entered upon a persistent campaign for funds and we shall not cease until through the generosity of the patriotic men and women of the Republic, we have sufficient equipment and endowment to make the University the peer of her American sisters.

The present financial campaign dates from November 14, 1906, when the formation of a committee now known as the Committee on Buildings and Endowment was formally authorized by the Board of Trustees upon recommendation of President Needham, and Professor Mitchell Carroll, of the University Faculty, was designated by them as chairman. The object of forming the Committee was to combine all efforts for raising money for the University under one controlling supervision and policy, and to undertake a campaign to secure by popular subscription sufficient funds to provide the necessary grounds and buildings and to afford adequate endowment for the educational work. The membership of the Committee was selected in the next few weeks, and on December 15 its first regular meeting was held and its organization was completed as follows:

Chairman: Mitchell Carroll.
Secretary: Frank L. Day.
Treasurer: Charles W. Holmes.

Thomas H. Anderson, Charles J. Bell, E. C. Brandenburg, John Joy Edson, James H. Gore, William B. King, John B. Larner, A. Lisner, H. B. F. Macfarland, Charles W. Needham, Hermann Schoenfeld, John B. Sleman, Jr., Charles D. Walcott, B. H. Warner, S. W. Woodward, Henry C. Yarrow.

Messrs. R. D. Harlan, Hennen Jennings, S. J. Peelle, and A. H. Snow were later added to this Committee.

The active work of the Committee began with the New Year. Realizing the large responsibilities it had assumed, the Committee determined to take one step at a time and, with its initial undertaking a success, then to proceed to larger things. There was a unanimous opinion that to enlist hearty support throughout the country we must first of all show what the City of Washington would do for the University. Hence the Committee decided to take as its initial task the raising of $200,000 at home for the erection of a building on the new site of the University. Shortly after this time the sale of the Van Ness Park site to the International Bureau of the American Republics, and the offer by the Dean heirs of "Oak Lawn," a beautiful estate at the intersection of Connecticut and Florida Avenues, made the question of the new site for the University the most important object of consideration. The Committee in consequence gave up its original plan and decided that its strongest possible appeal would be to ask the City of Washington to provide funds for the site, with the understanding that we should then look to the rest of the country for the endowment of the University.

The Dean property was offered for $800,000, with two donations from the heirs of $100,000 each. The late Theodore J. Mayer made a gift of about $185,000 for a memorial building on condition that the Dean site be secured. Two other sites of greater acreage but of about the same value were also under consideration by the Board of Trustees. With the funds in hand from the sale of Van Ness Park, $400,000 was the amount necessary to complete the purchase. It was decided to raise $200,000 of this fund in a public campaign, and $200,000 by private solicitation of people of large means.

To assist in the popular campaign a Citizens' Committee of one hundred and an Alumni Committee of one hundred or more were chosen. The membership of these committees is as follows:

CITIZENS' COMMITTEE.

Chairman: Thomas H. Anderson.

Vice-Chairmen: Milton E. Ailes, H. Bradley Davidson, W. B. Hibbs, N. Monroe Hopkins, Hennen Jennings, John B. Larner, A. Lisner, H. B. F. Macfarland, S. J. Peelle, H. S. Reeside, Alpheus H. Snow, H. C. Yarrow.

Secretary: Waldo C. Hibbs.

C. H. Ackert, Cyrus Adler, James F. Barber, Charles J. Bell, E. Berliner, Scott C. Bone, Bernard M. Bridget, Aldis B. Browne, Chas. Henry Butler, John Doyle Carmody, W. S. Carroll, D. A. Chambers, William L. Chambers, Thomas M. Chatard, Charles I. Corby, Arthur Cowsill, O. T. Crosby, John Joy Edson, Victor G. Fischer, John W. Foster, Daniel Fraser, E. M. Gallaudet, Ralph Galt, C. C. Glover, M. Goldenberg, Andrew B. Graham, Edward Graves, Samuel H. Greene, W. F. Gude, Richard A. Harlow, Robert N. Harper, Geo. H. Harries, Samuel Hart, John B. Henderson, Frank C. Henry, J. William Henry, Christian Heurich, Isaac R. Hitt, Jr., Charles W. Holmes, Thomas Hyde, Joseph Clark Hoppin, Louis Kann, Rudolph Kauffmann, D. J. Kaufman, Jas. Lansburgh, A. M. Lothrop, Samuel Maddox, Wm. F.

Mattingly, W. Duncan McKim, Willis L. Moore, A. C. Moses, W. H. Moses, Chas. E. Munroe, Charles F. Nesbit, F. G. Newlands, C. F. Norment, Theodore W. Noyes, E. Southard Parker, H. C. Perkins, E. G. Portner, D. C. Phillips, A. H. Plant, Frank K. Raymond, George L. Raymond, C. B. Rheem, Chas. W. Richardson, Cuno H. Rudolph, J. I. Saks, William H. Saunders, W. S Shallenberger, James Sharp, Edgar D. Shaw, Geo. H. Shibley, Geo. Otis Smith, O. G. Staples, Geo. M. Sternberg, Chas. C. Swisher, J. Macbride Sterrett, Wm. B. Thompson, Joseph E. Thropp, W. R. Vance, W. P. Van Wickle, Chas. D. Walcott, B. H. Warner, Simon Wolf, S. W. Woodward.

ALUMNI COMMITTEE.

Chairman: Edwin C. Brandenburg.

Vice-Chairmen: George N. Acker, N. Landon Burchell, John W. Chappell, Myer Cohen, John Paul Earnest, Theodore N. Gill, John W. Holcombe, Arthur Barnes Hooe, V. B. Jackson, William Bruce King, Fulton Lewis, Paul N. Peck, E. G. Portner, William A. Mearns, H. C. Thompson, Henry F. Woodard.

Secretary: Howard L. Hodgkins.

Percy Ash, Frank Baker, Louis K. Beatty, Walter V. R. Berry, Henry P. Blair, Montgomery Blair, John Wesley Bovee, Arthur T. Brice, Frank S. Bright, George Whitfield Brown, Frederick Carlos Bryan, William Kennedy Butler, Julian M. Cabell, Clarence Crittendon Calhoun, Henry Calver, William P. Carr, Frederick E. Chapin, Melville Church, Charles S. Clark, Walter C. Clephane, Frederick G. Coldren, Edward F. Colladay, Charles Follett Consaul, Joseph Winston Cox, William T. S. Curtis, Middleton F. Cuthbert, Allan Davis, Harold Davis, Wm. A. DeCaindry, Clarence Woods DeKnight, Edwin V. Dunstan, Addison G. DuBois, George L. Edmunds, Selden M. Ely, Henry H. Flather, James Holdsworth Gordon, Thomas S. D. Grasty, Francis M. Gunnell, Jonathan R. Hagan, Francis R. Hagner, William Hamilton, Fred L. Harvey, John C. Heald, John Brooks Henderson, Jr., John Thilman Hendrick, George Neely Henning, Frank H. Hitchcock, Howard L. Hodgkins, A. A. Hoehling, Jr., James Franklin Hood, James C. Hooe, Nevil Munroe Hopkins, Williston S. Hough, Charles E. Howe, Percy M. Hughes, James M. Johnston, Jacobus Seneca Jones, Henry E. Kalusowski, Albert F. A. King, John Wilmer Latimer, Philip F. Larner, Daniel Olin Leech, Hanson T. A. Lemon, J. Hall Lewis, E. G. Lorenzen, James I. McCallum, Ormsby McCammon, Louis Mackall, Jr., Thomas N. McLaughlin, Wallace Donald McLean, Dorsey Mahon McPherson, William A. Mearns, Oscar A. Mechlin, Leonard A. Merritt, Brice J. Moses, T. Percy Myers, Henry Beach Needham, Harry T. Newcomb, F. D. Owen, Richard E. Pairo, Paul N. Peck, Stanton C. Peelle, Arthur Peter, W. F. R. Phillips, Benjamin George

Pool, D. W. Prentiss, Henry A. Pressey, Teunis C. Quick, Preston B. Ray, Henry Willard Reed, Mason Noble Richardson, Wm. B. Robison, Sterling Ruffin, George C. Samson, Francis P. B. Sands, E. A. Sellhausen, D. Kerfoot Shute, John B. Sleman, Jr., Chas. S. Smith, W. H. H. Smith, Wm. T. Snyder, Zachariah T. Sowers, Edwin W. Spalding, James H. Spalding, Henry Clay Stewart, Jr., Alexander T. Stuart, Chas. L. Sturtevant, Corcoran Thom, Henry G. Thomas, H. C. Thompson, J. S. Ward Thoron, Leon Tobriner, John Tweedale, John Van Rensselaer, C. W. A. Veditz, John L. Weaver, Horace H. Wescott, J. J. Wharton, William Frye White, W. E. Whitson, A. G. Wilkinson, Wm. A. Wilbur, Henry K. Willard, Geo. F. Williams, J. Louis Willige, Andrew Wilson, Jesse H. Wilson, John C. Wilson, Henry F. Woodard, A. S. Worthington, R. E. Lee Yellott.

The Washington Site Fund Campaign was launched at a public meeting at the New Willard Hotel on the evening of February 25, when the matter of the site and the idea of the Greater University were presented by President Needham and other speakers. That evening $81,500 were subscribed in less than an hour. For the next four weeks the Citizens, Alumni, Faculty, and Students' Committees were actively at work. A series of public meetings was held on Monday evenings in March at leading hotels at which speeches in advocacy of the movement were made and subscriptions were announced.

The Washington Site Fund has continued to grow steadily and on Commencement Day it was announced that it had reached the sum of $150,075.20. President Needham's announcement on this occasion that the selection of the site must be postponed until more funds had been secured has quickened the determination of all concerned to bring this campaign to a successful conclusion. The committees are well organized, and early in October a second public campaign will be inaugurated with a view to raising the remaining $50,000 of the popular subscription. There will be no cessation of activity on the part of the Committee on Buildings and Endowment until the initial task undertaken by it of raising $200,000 from the City of Washington for the new site of the University has been successfully completed.

PLATFORM OF THE MOVEMENT.

In addresses made at the public meetings by President Needham, Mr. Justice Harlan, Mr. Justice Brewer, Mr. Justice Anderson, Rev. Drs. Hamlin, Radcliffe, and C. Ernest Smith, Hon. John Barrett, Rabbi Simon, and others, the George Washington University idea was made prominent, and this took form in a "Statement of Facts and Objects," prepared by Mr. C. A. Snow for the Citizens' Committee, and adopted at the meeting held at the Shoreham Hotel, March 11, 1907.

STATEMENT OF FACTS AND OBJECTS.

The Citizens' Committee of the District of Columbia, organized to further The George Washington University Movement, taking into consideration the various influences and interests throughout the country which are now working toward the establishment of a great University at the National Capital as intended by President Washington and his associates, to meet recognized educational needs, and believing that The George Washington University, by reason of the character of its organization, its history, and its position at the National Capital is fitted to be such a University, hereby adopt and publish the following statement of facts and objects:

Origin and Evolution of the University.

The George Washington University is a corporation, the origin of which dates back more than eighty-six years. It is the successor of the Columbian College of the District of Columbia, which was chartered by special Act of Congress on February 9, 1821, with all the powers commonly granted to American colleges. By special Act of March 3, 1873, Congress recognized the Columbian College as a University by changing its name to the Columbian University. By special Act of Congress of January 23, 1904, the Columbian University was authorized, on compliance with certain formalities, to take a new name. These formalities were complied with, and on September 1, 1904, the present name was adopted. By special Act of Congress of March 3, 1905, Congress recognized The George Washington University by this name and conferred upon it additional powers of the most comprehensive nature for carrying on higher education.

Its Unique and Comprehensive Powers.

The powers of the University are unique, and, it is believed, are sufficiently broad to cover every phase of higher education at the National Capital. While it may, under its charter, carry on undergraduate instruction directly through its departments, the charter authorizes it to apply in whole or in part the English system of carrying on undergraduate work through colleges which are educationally under its jurisdiction. Such colleges are organized by permission of the University under a special incorporating act contained in thè University charter. Each of such colleges has its own trustees, faculty, and financial foundation, separate and distinct from the University. All are, however, so under the jurisdiction of the University that they must conform to the standards set by it and can only present to it their candidates for degrees—all degrees being conferred by the University. It may carry on graduate work directly through its special University lecturers or through its departments, or, if found desirable, through colleges under its jurisdiction, and may give the proper degrees for graduate work. All the existing University systems may thus be applied by it in carrying on its work; and by this composite plan of organization, combining the advantages of a federal and a unitary system, the work of the University is standardized and coördinated, the time of the student economized, and the institution kept at the highest point of efficiency.

In addition to its power to permit the incorporation of colleges in the District of Columbia which are educationally under its jurisdiction, the University is authorized to affiliate with itself institutions of learning outside the District, which may desire to have the benefit of University affiliation.

Its Non-Sectarian Character.

The provision of the original charter of 1821 upon this subject was subsequently repealed, and a denominational provision was inserted. By Act of Congress of January 23, 1904, the denominational requirement was repealed, and the language of the original charter re-enacted. The provision reads as follows:

"Persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as president, professor, tutor, or pupil, be refused admittance into the University or be denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

Immediately after this last legislation, the Board of Trustees was reorganized so that no religious denomination has a control. This action was intended to signify, and does signify, that the University holds this provision to mean that the institution is forever to be non-sectarian.

This interpretation makes the charter accord with the expressed views of the framers of the Constitution and their associates. In the Constitutional Convention, James Madison and Charles Pinckney introduced, and James Wilson seconded, a resolution authorizing Congress to establish a University, "in which no preferences or distinctions should be allowed on account of religion." Washington, in his will, declared that he wished to see a University established in the District of Columbia, "on a liberal scale." President Monroe, in approving the original charter, said that it was "well digested," and that it "looks to the proper objects and grants the powers well adapted to their attainment."

Any attempt to make a sectarian institution of the University can be corrected by Congress, under its reserved power to alter or amend the charter.

The charter authorizes the establishment of a Board of Visitors, which may be representative of the interests of the country at large, and which will assure the observance of every provision of the charter.

Its Colleges and Departments.

The University has, in its various Faculties, over one hundred and sixty professors and teachers. It has thirteen hundred and fifty-eight students. It gives full day instruction in all its colleges and departments. Its undergraduate work in the arts and sciences is done by Columbian College, which, though bearing the name of the original institution from which the University has sprung, is nevertheless a corporation recently organized under the provisions of the charter of the University. Besides this college, there are two other undergraduate colleges, organized under the provisions of the University charter,—a College of Engineering and a College of Pharmacy. The possibility of giving undergraduate instruction through colleges under the jurisdiction of the University, on the broadest as well as on the most specific and practical lines, is thus illustrated. The graduate work of the University is done through a Graduate Department of the Arts and Sciences, a Department of Medicine, a Department of Law, and a Department of Politics and Diplomacy.

The Department of Politics and Diplomacy is being organized as a College of the Political Sciences, carrying on undergraduate, graduate, and professional instruction in American history, politics, economics, finance, international law, and diplomacy.

Its Financial Condition.

The University owns real estate, securities, and equipment, estimated at one million five hundred thousand dollars, against which there is an indebtedness of about five hundred thousand dollars. The clear assets of the University, therefore, amount to approximately one million dollars, of which two hundred thousand dollars belong to Columbian College.

The University derives its income at present almost wholly from tuition charges. Therefore the running expenses, including the interest charges, necessarily exceed the income.

It is a remarkable fact that while in other institutions of like character the tuition fees pay on an average only fifty per cent of the running expenses, in this institution, owing to the careful financial management and the self-sacrificing spirit of the professors and teachers, these fees pay seventy-five per cent of these expenses, the institution at the same time maintaining as high a standard as any in the country, and doing work which receives full credit in the educational world.

Objects of the George Washington University Movement.

Organized on these liberal and generous lines, situated at the National Capital, established for eighty-four years on a lesser scale and for the last two years on the broader basis, The George Washington University has already begun to attract the attention of the country. The wealth of material for the use of students which already exists in Washington is increasing daily at a marvelous rate, and graduate students are more and more finding themselves compelled to do a great part of their work in this city. A great University, free from all sectarian or partisan control, led by men of wide experience and culture, will formulate this mass of material and, by systematizing it and rendering it available for students, will make Washington the great center for graduate study; and the University will thereby become an important factor in determining, by dispassionate discussion, sound principles of political and economic action. Such a University may also be a very useful instrumentality for harmonizing and unifying educational movements. The undergraduate colleges will provide for the local needs, and will be sought by a great body of young men attracted to the National Capital, the great political and educational center.

George Washington and his associates in the Constitutional Convention realized that a great University, non-sectarian and non-partisan in character, exercising important functions in the life of the people of the whole country, organized under the power of Congress as the legislature of the District of Columbia, was a necessary and inevitable part of the National Capital. The plan of Constitution introduced in the Convention as a basis of action by Charles Pinckney, and which was used as the original draft of the Constitution, provided for a University at the seat of government, as an independent item. The Committee which reported the Constitution in its first form omitted this item, and Madison, in the Conventon, moved to restore it. The Constitution was again referred to a Committee, and was reported back with this item omitted, but with the provision giving Congress exclusive power in the Federal District. Again the question was brought before the Convention by the resolution above referred to, introduced by Pinckney and Madison and seconded by Wilson, authorizing the establishment of a non-sectarian University, and proposing to insert the provision among the specifications of the powers granted to Congress as the national legislature. Gouverneur Morris opposed the resolution, saying, "It is not necessary. The exclusive power at the seat of government will reach the object." The Convention accepted his view, thus adopting the principle that the University to be established at the National Capital should be organized by Congress as a corporation of the District of Columbia, under its powers as the legislature of the District and not under its powers as the national legislature. They feared, perhaps, lest a University wholly or principally supported by the national funds might not have that freedom of thought and action which are essential to the beneficent life and power of a University, and might, in times of political or religious excitement, be used by a political faction or a religious sect to disseminate ideas harmful to the Republic. They doubtless saw also, as Washington did, that a great educational corporation, supported wholly or almost wholly by the private generosity of the people of the country, established at the seat of government, would be able to render, and would render, great and peculiar services in many ways to the people of the whole country.

Washington, in speaking of a great University of the kind intended by the Constitutional Convention, declared that "the Federal City, from its centrality and the advantages which in other respects it must have over any other place in the United States, ought to be preferred as a proper site for such a University." In that part of his Will in which he made the bequest which he intended to be the beginning of an endowment of a great University in the District of Columbia, he declared that it had been his "ardent wish to see a plan devised, on a liberal scale, which would have a tendency to spread systematic ideas through all parts of this rising Empire, thereby to do away [with] local attachments and State prejudices, as far as the nature of things would or indeed ought to admit, from our National Councils," and which would enable the youth of the whole country to associate together at the Capital and "to acquire knowledge in the principles of politics and government."

The conclusion reached by the Constitutional Convention as to the necessity of making the University at the National Capital non-sectarian and non-partisan, was also reached by Congress in 1821, as the result of the debate in both Houses upon the bill for the charter of the Columbian College. The Senate, upon the insistence of certain Senators, inserted in the charter the non-sectarian provision above quoted. In the House a strong effort was made to insert a provision making certain high officials of the National Government *ex officio* members of its Board of Trustees and of a Board of Visitors, but, after a long debate, this attempt was defeated, doubtless on the ground that such a provision would give the institution a partisan character. President Monroe, approving the charter, said (as before in part quoted):

> "The act of incorporation is well digested, looks to the proper objects, and grants the powers well adapted to their attainment. . . . This institution, if it receives hereafter the proper encouragement, cannot fail to be eminently useful to the Nation. Under this impression I trust that such encouragement will not be withheld from it."

There is, therefore, a recognized need, clearly felt and pointed out by Washington and his associates in the Convention, of a great University at the National Capital, to fulfill certain great and beneficent functions in the life of the people of the whole country. It seems not too much to say that The George Washington University, existing under the Columbian College charter enlarged and broadened by the additional powers since conferred by Congress, to which the revered name of Washington has been attached by the consent and with the approval of Congress, was organized to be, is fitted to be, and is destined to be that University.

Therefore, the objects of this movement are, to establish The George Washington University upon a commanding site given by the people of the District, with ample endowment furnished by the private benefactions of the people of the whole country, and thus to create the great University Washington and his associates desired to see established at the National Capital.

NOTABLE TESTIMONIES TO THE GEORGE WASHINGTON UNIVERSITY MOVEMENT.

Early in April, Rev. Richard Davenport Harlan, D.D., LL.D., formerly President of Lake Forest College, was appointed by the Trustees Special Representative of the George Washington University Movement, and assigned the task of securing subscriptions for the Site Fund and for the endowment of the University from philanthropic men of wealth throughout the country. Dr. Harlan has enlisted the coöperation of a number of distinguished statesmen, jurists, public men, and leading educators, who have expressed their convictions as to the national importance of the efforts now being made to put our University on a broad foundation.

We quote letters from President Roosevelt and Secretary Cortelyou to President Needham, extracts from addresses made at the public meetings, and sentiments from letters addressed to Dr. Harlan,* as an indication of how impartial observers of educational needs and opportunities regard the plans for the development of the George Washington University as a great University for graduate work, specializing along those lines for which the Capital offers such unparalleled advantages.

President Roosevelt:

"Pray accept the assurance of my hearty sympathy in your work. I am delighted to learn that the chances are now so good for obtaining the necessary funds to put The George Washington University firmly on its feet. I congratulate you upon the work that the University has already done, and in common with all good citizens I wish you all possible prosperity in the future."

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*These letters appear in full in Dr. Harlan's pamphlet entitled "Notable Testimonies to the George Washington University Movement," copies of which may be obtained by addressing Dr. Harlan or the Registrar of the University.

Vice-President Fairbanks:

"It is impossible to exaggerate the importance of the work in which you are engaged. I am a firm believer in the establishment of such a university as this in the National Capital. There will assemble young men of ability from all portions of the country to enjoy facilities for education which will be unequaled anywhere. They will not alone be able to enjoy the advantages afforded by the great libraries and be permitted to study at close hand the mechanism of the Government, but they will be brought into intimate touch and association with young men from all portions of the Republic, who will become factors in all of the professional, business, political, literary, and scientific walks of life."

Mr. Justice Brewer:

"In suggesting the peculiar conditions of The George Washington University and the grounds upon which it may well appeal to the support of the whole Nation, these matters impress me much:

"First, the business of the Nation is carried on at the Capital, and this refers not merely to its political activities but also to those of a scientific character. Here are the headquarters of the various departments by which in all directions the Government is administered, and the student who is attracted to the subject of governmental administration will find no better place for prosecuting his studies than in the center of these activities.

"Again, Washington is not merely the center of the internal activities of the Nation, it is also the place where are considered and determined the relations and dealings between this and all other nations. All diplomatic matters in which the United States is interested find their way to Washington for solution. All questions involving our business relations with other nations and their citizens are here presented. So that the student who has a thought of making International Law his study and work in life will have the closest insight into the actual workings of that law as this nation interprets and recognizes it.

"These are considerations which make a University in the Capital, properly constituted and organized, one of great attraction and value to certain classes of students. In a reflex way, the instructors, who should be the most learned and competent men of the day, pursuing their several lines of investigation and study, will be constantly furnishing to those engaged in these national and international activities the best thought of the world. This reflex action is as important from a national standpoint, as the direct benefit to students from a personal standpoint.

"In these respects, a University in Washington properly constituted and equipped will not conflict with the work of other educational institutions, but will be pursuing a specific and separate field of labor, and one which rightfully appeals to the support of all the citizens of this Nation."

Mr. Justice Peckham:

"In regard to The George Washington University and its main object, the plan is one which ought to enlist the sympathies of all lovers of education. Considering the special circumstances that exist here in the Capital of the Nation, and which favor such an institution upon the broad lines mentioned, I think it would be one of the best things for the country at large to have such an institution in this city."

Mr. Justice Day:

"I have long shared the feeling that there should be at the National Capital one of the strongest and best institutions of Higher Education. No city in the country can rival Washington in especial advantages for such a University.

"The opportunities found here for the student in any branch of learning are unsurpassed in the assistance afforded by museums and libraries of the most comprehensive character. And, above all, I would place the inestimable privilege which a residence here gives to a student in the opportunity to observe the workings of his Government in the making and administration of the laws. The student of law will here find an opportunity to hear the best legal talent of the country in its court of final resort, and may hear the leading statesmen of the Nation in debate in the Senate and House.

"He will carry away not only the learning of the books, but the knowledge which comes from a near view of his Government in actual operation, information which should promote his patriotic interest in his country's welfare, making of him a better citizen as well as a scholar."

Speaker Cannon:

"The Nation's Capital is fast becoming the center of literary and scientific activity, and, with the advantages it enjoys, should not be behind in educational work. I see no reason why The George Washington University should not become one of the foremost institutions of learning in the world."

Secretary Root:

"There are many respects in which Washington furnishes a field for Higher Education absolutely unequaled by any other place in the United States.

"This is especially true of *Political Science, Jurisprudence, Diplomacy,* and *International Law.* The operations of a great Government here, with which a student can readily keep familiar, afford opportunities for a real understanding in these branches almost equal to those that a hospital furnishes to a medical student, or that travel brings to the aid of the study of geography.

"The National Government is making a strong and systematic effort now to limit appointments in the diplomatic and consular service to men of special fitness for such work. Of course that effort will be greatly promoted by having as many young men as possible educated and trained in the subjects with which such officers have to deal. The greater the class of trained men from whom we can draw for appointments in the foreign service, the more easily we can maintain a high standard in this service.

"I am, accordingly, much interested in the success of that department of The George Washington University."

Secretary Cortelyou:

"I am very glad to have this opportunity to commend heartily the movement that has been inaugurated to raise $400,000 as a site fund for The George Washington University. As an alumnus of the University I naturally feel a personal interest in the success of such a movement. The citizens of Washington generally have shown their willingness to respond to the University's needs, and I am sure that this further appeal will meet with such a generous response that the broad and comprehensive plans for its development may be fully realized."

Secretary Taft:

"Washington is better adapted for the home of a university than any other city in the country. A really great university here would have its being in the national and cosmopolitan atmosphere of the Capital of the country, and at the same time would constitute a valuable leaven and influence for culture and learning in the political and social life of this city. It would be a compliance with the purpose of George Washington as outlined in his Will and would be a place where *Northern, Southern, Eastern, and Western influences would unite to form a national American spirit.*"

Secretary Garfield:

"The position of this University is unique, in that it offers an unusual opportunity for bringing together students from all sections of our country. Its work should increase the sense of unity and emphasize the national spirit, and should not only show to its students the opportunities which are before the man who devotes himself to public work, but, as well, the obligations which he owes to the Nation."

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Secretary Straus:

"I am gratified to see the advanced step The George Washington University has taken to develop a great University for Graduate Work at the National Capital.

"The various governmental institutions, such as the Coast and Geodetic Survey, the Bureau of Standards, the Smithsonian Institution, the Supreme Court of the United States, the Library of Congress, and Congress itself, when in session, can all be availed of to the greatest advantage by the students of a university located in this city. No other city in the world has ready at hand such educational facilities in a concrete working shape as are found in this Capital.

"I am gratified to know that The George Washington University has planned its foundations upon broad lines, and I am sure, with the facilities that it will command, it will offer advantages of the very highest order, which no other university in the land, no matter how richly endowed, can supply."

Hon. James Bryce, the British Ambassador:

"Washington seems to possess several quite special advantages fitting it to be the seat of a great University. Unlike your other great cities, it does not feel the strain and pressure of commerce and manufacturing industries. It contains an unusually large number of residents—temporary during the sittings of Congress, or permanent—who are qualified to act as advisers in University matters, men with a diversified experience of public affairs and a wide knowledge of the whole country. As the Seat of Government, it draws to itself, more perhaps than any other city, persons of all types, of all stocks, of all interests. There is something truly metropolitan about Washington, and a great metropolis ought to find one of its chief ornaments and glories in an institution dedicated to the highest forms of education and research.

"As I gather that it is proposed to make the teaching of the Historical, Political, and Economic Sciences prominent in the scheme of instruction and to make liberal pecuniary provision for the pursuit of them, it seems worth while to add that no place could be so well fitted to give actuality to the study of those subjects, and to enable students to test theories and abstract doctrines by comparison with concrete facts, as is the spot where Congress sits, where the Supreme Court sits, where the great administrative departments are at work, and where a great deal of extra-official political activity goes on.

"Washington has already gained so much by the presence of a large number of distinguished scientific men that the addition to its society of a group of men eminent in History and Economics, such as the proposed University would bring to the city as professors, might well be deemed an important incidental benefit to the life of the Capital."

M. Jusserand, the French Ambassador:

"I join heartily in the good wishes for the success of that noble undertaking, the greater George Washington University. That you will reach your goal I do not doubt.

"Like a human being, *a university, in order to succeed, must answer a need and adapt itself to circumstances.*

"Now, the city in which The George Washington University is meant to develop is not famous for its trade; its industries enjoy no celebrity and the world has heard little of its agriculture and navigation. But famous is its Supreme Court, famous its Capitol, famous, I may say, its White House, very famous indeed. It is preëminently a city of magistrates and statesmen, representatives of eternal Justice and of the (not perhaps quite so immutable) will of the people.

"These are striking conditions, and your intention to fit the University more and more exactly to them is certainly a move in the right direction. Universities must, to be sure, produce all sorts of men; but it is quite natural that each university should pay more attention to one special kind of knowledge. Let other universities choose, as their specialty, literary training, scientific training, or commercial training; The George Washington University cannot hesitate and has no choice:—*it will become famous and be of use to the country as a nursery of magistrates, statesmen, and diplomats.* . . . .

"As a friend and guest of this city, and of this Republic, I can form no better wish for your University than this: May it be as successful as the "*École des Sciences Politiques*" has been in France; may it prove as useful to the United States in their prosperity as it was to us, "*patriæ tempore iniquo.*"

Hon. John W. Foster, Ex-Secretary of State:

"From almost every point of view the full equipment of a great University at the Capital of the Nation, especially for post-graduate studies, is highly desirable. It will prove particularly appropriate and useful in its department of Politics and Diplomacy. For such a school no other locality in the country can offer such facilities and incentives. The great libraries located here, both general and special, the different departments of government serving as object lessons, the sessions of Congress, and the opportunities for contact with the diplomatic corps, make Washington the ideal place for a school of Politics and Diplomacy.

"I have long felt that some one of our men of wealth could not do a more patriotic or useful act than to endow such a school, in connection with The George Washington University, and thus worthily perpetuate his name as no other provision of his fortune could."

Hon. Andrew D. White, Ex-President of Cornell University:

"*I have long believed that the next great institution of learning founded in the United States should be at Washington.*

"Years ago I published a series of articles in the *Forum* to call attention to the enormous wealth of books, laboratories, collections, and illustrative material generally available for such a University to be found in our Capital City, and the time which has passed since then has only strengthened the conclusions at which I then arrived—so much so that I presented the subject again in two recent addresses at Washington, one before the Cornell Alumni Association, and the other in the presence of a large number of leading citizens of Washington.

"I quite agree with President James in his statement that a University at Washington would have certain advantages and could do certain most valuable work for the country which no other single institution could do.

"But my main reason for desiring to see the establishment of a University in that city is that *it would draw together a very large attendance of students from North and South to understand each other, and to form those student friendships which would do more than anything else in putting an end to any estrangement that may still linger between North and South.*

"Under these circumstances, I wish you all success, and most heartily commend the effort which you represent to the American people."

Hon. H. B. F. Macfarland, Commissioner of the District of Columbia:

"We have George Washington for our spiritual father, and so have a right to bear his great name. *We are aiming to obey his last command to establish a great University at the National Capital that will be worthy of the Nation which he created.* . . . .

"We are confident that the University—now so strong, with its fine Faculty, its 1600 students, its unexampled spirit, and all the opportunities of the National Capital, the natural place for a university and for research work, and already rich in the good will of this community in which it is located—will have the sympathy and support of patriotic and public-spirited Americans everywhere. The interest in the National Capital and *the desire of the people of our country everywhere to see that Capital developed and embellished will not be ignored in the case of this University.* The national life, informed and inspired by it, must find the crown of its expression at the National Capital and in a University national in its scope, where ardent students, from all over the country, may behold 'the bright face of Truth in the quiet and still air of delightful studies.'"

Hon. John Barrett, Director of the International Bureau of the American Republics:

"Having been a United States minister in many different countries, I have, of course, listened to a great variety of comment on American civilization, American institutions, and our American Capital, the City of Washington.

"It is remarkable, in view of the present movement to promote the interests of The George Washington University, that everywhere in foreign lands I have heard surprise expressed that there was no great University in the Capital of the United States. We have little idea how well-known this city is among foreign peoples. In many parts of the world, where the names of New York, Boston, and Chicago are never spoken, there is knowledge of the Capital City, named after the first man of this country.

"The name of George Washington is one with which to conjure in all portions of the world. It carries a magical significance, not only in Japan and India, but in Africa and South America. A city, therefore, and an institution that are named after the Father of His Country are expected to be the best that the country in which they are located can produce. . . .

"I venture to say, therefore, that were The George Washington University, to-day, an institution known far and wide, it would have among its throngs of students no small proportion from South America, Europe, Asia, and Australia.

"*What better influence could there be to strengthen our prestige and standing abroad than to have in attendance at The George Washington University representative young men from all the leading countries of the world, and especially from those which are looking to us to set them an example?*

"Let us, therefore, though the hour is late in the history of the United States, make up for the deficiency of the past and provide at the Capital the opportunity for Higher Education that is expected in other parts of the world."

Secretary Walcott of the Smithsonian Institution:

"I have long believed in the development of a University in Washington that would take full advantage of the unique opportunities offered by the Government bureaus for the special training of postgraduate students in all branches of Science. . . . .

"Congress has enacted that the vast collections and resources at the command of the Government shall be available for Higher Education and research, *but it has not provided the machinery for making them practically available.* As in the case of grants of land to colleges, Congress provides facilities and indirectly the means, *but it*

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cr university desires to do. An ever-growing constituency is furnished by the men drawn to Washington for various purposes, so that the building up of a strong University in Washington is not merely an addition of a new institution to those already existing, but *it is the establishment of an intellectual center in a unique strategic position.*

"Such an institution, NOT *controlled by, but coöperating with the Government,* ought to fill a real place in American Education."

President Faunce of Brown University:

"I have always believed that Washington has advantages above all other cities in this country for the development of graduate study. While steadily opposing the idea of a University supported and controlled by the National Government, I have as steadily maintained that some day we should see in Washington a collection of graduate schools which would do honor to the Nation and furnish immense stimulus to research in every field of human knowledge.

"The plans of President Needham are broad, statesman-like, and thoroughly feasible. The new site chosen is one of rare beauty and commanding outlook. A university in Washington can do for the Southern States what no Northern university can achieve. A university in Washington would tend to unify all the Higher Education of the country."

President James of the University of Illinois:

"I regard this as an exceedingly important undertaking, and I believe you may conscientiously urge it upon the attention of every American citizen as one of the important projects in the field of Higher Education in which he ought to be personally interested.

"I do not see how any one can go over the history of the movement for the establishment of a great University in the Federal Capital without becoming convinced that it is destined to succeed. It is simply a question of whether the time has yet arrived. I believe *it is at hand,* and I am sure that every many who can contribute to the realization of this great project may feel that he has been helpful in a great service to this Nation."

President Thwing of Western Reserve University:

"The George Washington University Movement seems to me of the utmost importance for the interests of the Higher Education, and also for those interests of this Nation and of this world which the Higher Education in the United States is set to serve. You ought to ask for an endowment of many millions of dollars. The Higher Education is costly, and the higher it is the more costly it is; but the results for civilization prove that the costliness is not excessive; for while there is a need in America, as in the world, of the lifting of the intellectual and the moral level of humanity, there is also dire need of great leadership. Great leadership the Higher Education promotes."

Mr. Joseph Wharton, Founder of Wharton School of Finance and Commerce, University of Pennsylvania:

"Having long been of opinion that there ought to be somewhere in this country at least one institution where persons could be trained for our consular and diplomatic service, I had expected the 'Wharton School of Finance and Commerce' to set up a course of instruction on that line, but this has not yet been done nor even commenced. If The George Washington University shall take up the task of such training, *it will no doubt be better done there than would be possible at any other place,* since the vast amount of information contained in the Government archives forms a mass of material which can never be matched elsewhere.

". . . . *The special training which is so obviously and grievously needed as preparation for our consular and diplomatic service can be better given in Washington and by the proposed enlarged University than anywhere else. . . .*"

leaves to other agencies the task of devising ways and means to make them practically useful.

"I think that the present movement has great promise, and that if this work can be developed under The George Washington University *it will result in the advancement of Higher Education throughout our country, and provide the Government and all educational institutions with a body of well-trained men that will be of the greatest service in the upbuilding and strengthening of our civil and educational institutions.*"

President Pritchett of the Carnegie Foundation for the Advancement of Teaching:

"It has given me pleasure to learn of the definite effort being made to develop The George Washington University into a strong University at the Capital.

"Most men connected with Education in the United States realize that we have in many parts of our country more colleges and universities than can be well sustained; *but from my knowledge of the situation in Washington, I feel sure that Washington presents to-day a unique opportunity and an unusual field for university effort.*

"There could be no more wholesome influence in our National Capital than would be furnished by the intellectual and moral atmosphere of a strong University. Furthermore, the facilities of the Government itself supplement in the most effective way the work which a university desires to do. An ever-growing constituency is furnished by the men drawn to Washington for various purposes, so that the building up of a strong University in Washington is not merely an addition of a new institution to those already existing, but *it is the establishment of an intellectual center in a unique strategic position.*

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ology, and the application of the Physical Sciences to Agriculture it seemingly must lead all others.

". . . The sections from which an important University at Washington will be most likely to draw its students are the West and South. As the result of an increased disposition to seek educational opportunities as far east as the District of Columbia, many a student will find his way for a year or two at Johns Hopkins, Columbia, or Harvard who, but for the attractions of the Capital City, would never have gone beyond the Senior year of the little provincial college in Texas or South Dakota.

"Thus, with scholarly assets already well developed and with comparatively few liabilities, *the other leading American communities can afford to regard with friendly interest and without jealousy the present movement to secure an EDUCATIONAL CAPITALIZATION of the Smithsonian Institution, the National Museum, the Bureau of Standards, the Congressional Library, and all the other working laboratories of the National Government; for the existing federation of intellectual capitals of the continent is certain to persist.*"

THE GEORGE WASHINGTON MEMORIAL ASSOCIATION.

The George Washington Memorial Association, the body of patriotic women organized "to advance and secure the establishment in the City of Washington of an University for the purposes, and with the objects, as substantially set forth in and by the last Will of George Washington, the first President of the United States, and to increase the opportunities for Higher Education of the youth of the United States," and which, in recognition of our change of name, agreed to erect on the new site of the University the George Washington Memorial Building for graduate study and scientific research, held its annual meeting at Rauscher's in Washington City, February 20, 1907. At that time the following officers were elected:

President: Mrs. Herbert Wadsworth, of Washington.

Vice-Presidents: Mrs. Chas. D. Walcott, of Washington; Mrs. Henry R. Mallory, of New York City; Mrs. Chas. J. Bell, Miss Bessie J. Kibbey, Mrs. Fred. B. McGuire, and Miss Alice R. Seward, of Washington.

Trustees: Mrs. Archibald Hopkins and Mrs. Murray Crane, of Washington; Mrs. Leslie C. Wead, of Massachusetts.

Corresponding Secretary: Mrs. Robert S. Chew, of Washington.

Recording Secretary: Mrs. Susanna P. Gage, of New York.

Treasurer: Mrs. Frank Northrop, of New York.

The new president, with her able executive board, has been actively at work, and plans have been formed for the enlargement of the membership of the organization, and the accumulation of the five hundred thousand dollar fund for the Memorial Building. These efforts have taken form in an address to the members of the George Washington Memorial Association:

ADDRESS.

"As a member of the George Washington Memorial Association you are earnestly appealed to to carry out the object which you helped to inaugurate.

"The dream of a century is about to be realized. It is, in effect, the establishment of what we hope in time will become a national university in the Federal City—a project that was dear to the heart of George Washington, our first President, and for which he thought he had made liberal provision in his Will. You are aware, however, that the fifty shares in the Potomac Company which he bequeathed toward the endowment of a University to be established within the limits of the District of Columbia, and which was appraised after his death at five thousand pounds sterling, or almost thirty thousand dollars, ultimately became unproductive. The ardent wish, therefore, of the Father of His Country, that 'the youth from the different parts of this rising Republic' might assemble at the Seat of Government and learn there, not only arts, sciences, and *belles lettres*, but the principles of Republican Government and the spirit of tolerance, has been unfulfilled, and, until lately, almost forgotten. You are one of those who, as members of the George Washington Memorial Association, have helped to keep alive the memory of Washington's idea, and bring to fruition, after a hundred years' gestation, the enterprise conceived by him. Will you go on with the good work in which many others have now become interested, and give your money and lend your influence to its completion?

"You will remember that this Association in which you hold membership was incorporated in September, 1898, as the result of a meeting of patriotic women held in Washington during the previous December. It was organized for the purpose of increasing in the City of Washington the opportunities for Higher Education, in accordance with the recommendations of George Washington in his various messages to Congress, especially the first, and substantially as set forth in his last Will. The members of the Association soon came to the conclusion that they might most appropriately make a visible manifestation of the desire that was in them by erecting a building which should be the Administration Hall of the University, whenever that should be established. This Hall should contain not only the administrative offices of the University, but also lecture rooms for the post-graduate courses and a large auditorium for the meetings of scientific and patriotic organizations and of national and international tribunals. This building was to be known as the George Washintgon Memorial, and affectionately dedicated to the memory of the first President and his interest in Higher Education in America.

"Before any considerable sum had been raised for the erection of this building, a movement for the establishment of a great University at the National Capital began to make itself felt. Revival of interest in this idea was largely the result of a gradual evolution during a period of eighty and odd years of the Columbian College of the District of Columbia into George Washington University. In this development our George Washington Memorial Association played a not unimportant part. The Columbian College, which had been chartered by special Act of Congress, on February 9, 1821, was converted by special Act of Congress, on January 23, 1904, into the Columbian University. By the Acts of April 12, 1892, and of March 1, 1901, Congress had provided that the scientific resources of the Government, the laboratories, the libraries, and the museums of the great bureaus should be available for Higher Education and research, without providing, however, the machinery to make them practically available. In order to aid in securing to students the more extensive use of the exceptional advantages thus provided by Congress, the George Washington Memorial Association entered upon negotiations with the Columbian University. This institution had been one of the first to avail itself of the advantages offered by Congress, and it was furthermore worthy of special note because it possessed an exceptionally excellent charter. In pursuance of these negotiations Columbian University became, by special Act of Congress on September 1, 1904, The George Washington University, and Congress later conferred upon it additional powers of the most comprehensive nature for carrying on Higher Education. Undergraduate instruction is now given through colleges under the jurisdiction of the University, the undergraduate College of Arts and Sciences retaining the name of the original institution, Columbian College. An institution being thus established which might fairly be supposed to approach George Washington's ideal of a national university, the Memorial Association undertook with renewed vigor to realize its most concrete purpose— the erection of a Memorial Building which shall serve the University as an administrative center. It is for this work that your assistance is now needed. The definite plea addressed to you, then, is this: Send in your annual subscription fee of two dollars and persuade your friends to join the Association also. . . .

"Five distinguished firms of architects were invited to prepare plans in competition for our Memorial Building. The plans of Messrs. George A. Post & Sons, of New York City, have been accepted, and are on exhibition in the Library of Congress. The building is so planned, in its character, proportions, and facilities, as to be worthy of its high object.

"The advantages to the Association of an alliance with The George Washington University are, first, the gift of a site for the Memorial Building, and, second, its maintenance for all time. The total cost of the building, it is estimated, will be about $500,000, and that is the sum which the members of the Association, including yourself, are expected to raise. Will you do your part?

"A new stimulus has recently been given to the movement for a great University, and consequently to the interest in a Memorial Building to be the heart of that University, by the creation of a Citizens' Committee of the District of Columbia for the purpose of collecting sufficient money to buy a desirable site for the University. The work of raising a fund of $400,000 for the purchase of such a site was well started in Washington this winter, over $80,000 having been subscribed in less than an hour at a meeting which was attended by about 100 people. Since then contributions have continued to come in, and there is no doubt but that the citizens of Washington will promptly raise the necessary funds for purchasing a commanding site.

"While the citizens of the District are buying beautiful grounds for the University, and its rich friends are pledging large sums for the erection of noble buildings on that suitable site, wherever it shall be, the George Washington Memorial Association desires to do its part by collecting from the people of the country, in large or small sums, the money needed to erect the Administrative Hall which is to be the particular memorial of the great man whose idea the University embodies.

"It is not desired that this building shall be the gift of a few, but of the patriotic many. It shall be the Valhalla of the Nation, a palace of immortality to enshrine the memories of those great souls who laid the foundation of our country's greatness, or who in future may contribute to that greatness, in which we all, rich and poor, high and low, have an equal heritage."

WHAT THE UNIVERSITY IS DOING.

The University.

The session of 1906-07 has been the most prosperous, all things considered, in the history of the University. Although the students' attendance is not so large as that of the previous session, owing to the raising of standards and the increase in tuition fees, the number of regular students devoting their whole time to the work is larger than ever before in the history of the University. The total enrollment is 1292, representing 48 states and territories, Hawaii, Porto Rico, and the Philippines; of foreign countries, Australia, China, Corea, Costa Rica, England, Finland, Germany, Mexico, Nova Scotia, Peru, Russia, and Uruguay. The student body consists of 76 graduate, 492 undergraduate, and 754 professional students, with 30 duplicates. The members of the faculties and teaching staff now number 208, distributed as follows: 85 professors, 27 assistant professors, 72 instructors, demonstrators, and assistants, 16 lecturers, and 8 librarians and assistants.

During the session the Department of Politics and Diplomacy has undergone a reorganization, and with the beginning of next session is to be known as the College of the Political Sciences. A Division of Education has been formed which is a development out of the Teachers' Courses which have been so successful for several sessions. The University Library has been enriched through the donation of several thousand volumes in addition to its regular purchases. The classical library of the late Professor Curt Wachsmuth, of the University of Leipsic, has been recently purchased by the University and distributed in the stacks. It contains 7900 volumes and pamphlets bearing on Greek and Roman philology, literature, archeology, and history. The possession of the Heinzel Germanic library, purchased two years ago, and of the Wachsmuth classical library gives our Arts and Sciences library high rank among the university libraries of the country. The work of classifying and cataloguing the contents of the various libraries has been successfully carried on by the librarian and his assistants.

The University Bulletins have been regularly issued under the supervision of the Board of University Publications. The Alumni number which appeared in June, 1906, contained a summary of the work of the session of 1905-06, and an account of the Trustees and Alumni annual dinner. The October scientific number was devoted to the Department of Medicine and contained papers by Drs. Carl Beck, Munroe, Carr, Bovée, Claytor, Grasty, Donnally, Howard, Smith, and Hooe; most of which had been read before the University Medical Society. The December Bulletin was the Faculty of Graduate Studies number and contained important papers in the realm of the physical and natural sciences by Professors Gill, Frisby, Bigelow, James Carroll, Abbot, and Sternberg, and abstracts of theses by Messrs. Whitehead, Ely, and Shear, and Miss Brewer and Miss Ludlow. This number also contained a bibliographical record of the University, as the 1905-06 Supplement to the University Bibliography. The University Catalogue appeared in March, 1907, together with the separate announcements of the Departments of Arts and Sciences, Medicine, Dentistry, and Law. The October issue is to be devoted to the Faculty of Graduate Studies, and the December number to one of the professional departments. The

University publications are sent to 234 American universities and colleges and 90 foreign universities; and the list of exchanges already received embraces 45 American and 20 foreign scientific periodicals in addition to catalogues and circulars.

DEPARTMENT OF ARTS AND SCIENCES.

Faculty of Graduate Studies.

The total number of students registered under the Faculty of Graduate Studies for the year 1906-07 was 77; there being 12 candidates for the M. A. degree, 10 candidates for the M. S. degree, 10 students in attendance, and 45 candidates for the Ph. D. degree. The total number recommended for graduation was 13, of which 5 were for the M. A. degree, 2 for the M. S. degree, and 6 for the Ph. D. degree. Three of these degrees, there being one each in each of the above named categories, were conferred at the Winter Convocation. This is the first time that the Ph. D. degree has been conferred by this University on any other occasion than the Commencement. A Doctorate Disputation was held for the first time in February, and on May 27 Doctorate Disputations were held for the fourteenth time since this institution was established. Five candidates presented themselves and all were recommended for the degree sought. It is gratifying to record that the attendance at these disputations was larger than an any previous occasion, and that others in attendance besides the members of the boards of experts took part in the disputation. We may recall that the disputations as conducted here are unique, and for a time were looked upon as an experiment; but the experts selected have been of such eminence and fitness, they have performed their duties in so serious a manner, and have subjected the candidates to such searching examinations, that we are justified in regarding this departure as warranted. Not the least of the advantages which have resulted is the opportunity which these occasions have afforded for the discussion of the problems of Higher Education with eminent specialists who have been able to observe the results of our work.

As a result of these conferences the Faculty has, during the past year, revised the requirements for the Ph.D. degree, and while still standing for the principle of specialization in research, it has emphasized the requirement that in order to graduate the candidate must possess a broad acquaintance with his major topic. His studies must be pursued under the guidance of a committee consisting of the professors in charge of the University subjects in which the studies are pursued, with the professor in the major subject as chairman, and this committee is expected to apply suitable tests to prove the candidate's qualifications. By action of the Faculty it becomes the duty of the chairman of this committee to see that the candidate's record is complete and in accordance with the requirements for the degree sought.

During the year Asaph Hall, Jr., Ph.D., has been appointed Professor of Astronomy, and Shepherd Ivory Franz, Ph.D., Professor of Experimental Psychology, thus strengthening these subjects. We now need additional professors in Mathematics, Applied Mathematics, and the Natural Sciences in order to be able to offer a larger range of advanced subjects for qualified students, and furnish subjects properly correlated to those now offered. Attention is called to the advantages which Washington enjoys for the study of Agricultural Science, and it is recommended that this University should especially provide for the graduates of the Agricultural Colleges.

Columbian College.

The registration of students for the year 1906-07 was as follows: Candidates for the B.A. degree, 86; candidates for the B.S. degree, 58; special students, 75; auditor, 1; total, 220.

Twenty-seven college students received degrees during the year, eighteen receiving the degree of Bachelor of Arts and nine the degree of Bachelor of Science.

The change in the plan of the required Freshman English, introducing as a part of that work studies in Logic and Psychology, went into effect this year. Such coöperation as this between English and Philosophy has increased the efficiency of other work during the year. A valuable course in Comparative Biology has been given by the Professors of Botany and Zoölogy. Courses of Comparative Literature are planned in the subjects of French and English for next year.

Ninety-two women students have been registered this year; one-half of these are in the regular B.A. course. All indications emphasize the stability and seriousness of this class of our students. Their distinctive interests have made the appointment of a Dean of Women so obviously appropriate that it has appeared from the first a part of the natural order of things. During the winter a Young Women's Christian Association has been organized with a membership of forty-five.

The following facts about the educational work are worthy of note. First, the standard of admission adopted years ago has been interpreted with increasing severity and this has tended to give us better students; second, the increase in tuition fees has discouraged the less serious students, affecting chiefly the special student class, and this influence has left the regular students predominant; third, the standard of college work has been very generally raised, both in quantity and quality.

The requirement of two years of college work for admission to professional courses of study gives the professional departments a direct relation to the College and an immediate concern in it. Columbian College will be an exception to the rule if it does not become the chief source of supply for the professional courses in the University. The College rejoices in the growing consciousness of interdependence in our University life.

Washington College of Engineering.

The number of enrolled students has been 142, distributed as follows: Civil Engineering, 58; Electrical Engineering, 40; Mechanical Engineering, 18; special, 26.

The class distribution was: Freshmen, 37; Sophomores, 39; Juniors, 34; Seniors, 6; special, 26.

It is very gratifying to note that the attendance is larger than during the session of 1905-06, notwithstanding the rigid enforcement of entrance requirements and the increase in tuition fees. The additions to the teaching staff of two men giving their entire time to the work, and of two others giving part time, made possible the enlargement of the work to a considerable extent. The class-room courses in engineering were supplemented by many hours of required work in the drawing rooms, and all of the laboratory work was more efficiently conducted. In the technical subjects there were given 52 hours of class-room work and 80 hours of drawing, laboratory, shop, or field work each week. This is an increase of 10 hours of class-room work and 51 hours of drawing and laboratory work each week.

For next session additional courses amounting to more than 20 hours must be given. At the same time, we plan to provide more careful supervision of the drawing rooms, and an enlargement of the laboratory work. Three additional instructors have been appointed for the session of 1907-08, one in Civil Engineering, one in Electrical Engineering, and one in Mechanical Engineering. This will give us a force, in the engineering subjects, of seven men devoting their whole time to the College work and one man giving part time. The general subjects of Mathematics, English, Languages, and Sciences, are taken in common with the students of Columbian College, and the Faculty of Engineering therefore may be correctly stated as containing twenty-seven officers of instruction.

The sale of the Van Ness property and the postponement of the selection of a new site has made necessary the rental of temporary quarters. Three connected residences on I Street within four minutes walk of the main building of the University have been leased and will be adapted to our uses. In addition, a building about eighty by twenty feet will be constructed and fitted as a mechanical laboratory. These buildings will give us larger and better quarters than we have had in the Van Ness House, and will serve us well until a special engineering building is constructed after the selection of a new site.

DIVISION OF ARCHITECTURE.

In this division 37 students were enrolled, and there were 8 regular teachers in the architectural courses opened to them. The work of the students in design has been most satisfactory; great interest has been taken in the *Beaux Arts* problems, and 32 drawings have been sent to the Exhibitions in New York. Twenty-four of these drawings received favorable mention. The library facilities have been much improved through the loan by Professor Remey of his excellent architectural library and collection of photographs. The Students' Architectural Club has had special meetings throughout the year with illustrated lectures by eminent men.

COLLEGE OF THE POLITICAL SCIENCES.

The Department of Politics and Diplomacy, which was founded in 1898 as a graduate branch of work of the University, will in the fall of 1907 become the College of the Political Sciences,—a separate part of the educational system of the University, offering undergraduate and graduate courses.

The undergraduate degree will be that of Bachelor of Arts. The graduate degrees will be Master of Arts and Master of Diplomacy, both of which will require one year of graduate study.

The undergraduate work in the new college will be divided into seven "groups" of studies, each group being designed to prepare the student for a particular career. These groups will be designated as follows: The Diplomatic Group; the Consular Group; the Law and Administration Group; the Journalistic Group; the Business Group; the Sociological Group; and the General Political Science Group.

This enlargement of the work brings with it the necessity for an enlargement of the Faculty. In addition, therefore, to the Faculty of the old Department of Politics and Diplomacy four new men have been appointed for work in the new College. These men are Professor W. W. Willoughby, Ph.D., of Johns Hopkins University, who will give two courses in political science; William Ray Manning, Ph.D., who has taught for two years at the University of Chicago, and for three years at Purdue University, and whose title in the new College will be Assistant Professor of Diplomatic History; Howard Lee McBain, Ph.D., of Columbia University, who will become Instructor in Political Science; and Professor Henry Parker Willis, Ph.D., now of Washington and Lee University, who will become Professor of Finance. It is likely that the teaching force in the new College will be further strengthened through the addition of lecturers in special subjects, such as Transportation, Political Journalism, and Business Organization.

Under the new organization it may truthfully be said that for the first time it is planned to make systematic educational use of the unique facilities which Washington offers for the study of the political sciences, including economics, history, sociology, international law, diplomacy, and allied subjects.

THE DIVISION OF EDUCATION.

In order to meet the local demand for the professional training of teachers, and at the same time to provide instruction in education as a department of science, the University has established the Division of Education, with the expectation that the growth of the work will, in the near future, justify its organization as a Teachers' College. The courses of instruction have been planned to meet the needs of (a) undergraduate students who wish to combine a regular college course with thorough training for the profession of teaching; (b) teachers in actual service who may desire to add to their professional qualifications by taking further special training; (c) graduate students who wish to fit themselves for the more responsible positions in teaching or in school administration. For the first, a four years' course has been established, denominated the Teachers' Course. It may be taken in conjunction with either the Bachelor of Arts or Bachelor of Science course. For the second, provision has been made, first, by offering the greater number of the professional courses in the late afternoon, and on Saturday, so that they may be taken by teachers or by persons occupied in Government departments; second, by offering to teachers in actual service Scholarships of a value of one-third the regular fees, on conditions named in the " Special Announcement " of the Division. For graduate students, the exceptional facilities existing in the extensive collections of the Library of Congress and the library and archives of the U. S. Bureau of Education, afford unrivalled opportunities for historical research; while the school system of a large city, and the laboratories of the University, present ample opportunity for observation and experiment. In recognition of the professional training received, students who graduate in the Teachers' Course will be granted, in addition to the Bachelor's degree, a Teacher's Diploma. As a teaching staff, to give instruction in the professional branches, the Trustees have appointed the following: Williston S. Hough, Ph.M., Professor of Philosophy in Charge of the Division of Education; William Carl Ruediger, Ph.D., Assistant Professor of Educational Psychology; Elmer Ellsworth Brown, Ph.D., U. S. Commissioner of Education, Lecturer on Education; William Estabrook Chancellor, A.M., Superintendent of Public Instruction, District of

Columbia, Lecturer; George E. Myers, Ph.D., Principal McKinley, Manual Training School, Lecturer; Willard S. Small, Ph.D., Principal Eastern High School, Lecturer; William W. Black, A.M., Supervising Principal, Lecturer; Stephen E. Kramer, B.S., Supervising Principal, Lecturer. Courses are offered in the principal branches of educational theory and practice as follows: History of Education, 2 courses; Educational Psychology, 5 courses; Principles of Education, 5 courses; General and Special Method, 7 courses; Administration and Supervision, 5 courses; Practice Teaching, 2 courses. A Teachers' Appointment Bureau has been established for the purpose of aiding students in securing desirable positions as teachers.

FACULTY OF MEDICINE.

DEPARTMENT OF MEDICINE.

The total registration was 226, the students being distributed as follows: First year, 48; second year, 46; third year, 46; fourth year, 75; special and review students, 11. The degree of M.D. was conferred upon 63 members of the Senior class. There have been more students devoting their whole time to the work, and fewer falling out during the year, than ever before. So that although the attendance is somewhat smaller than that of last year, the student body is composed of more stable material. By special direction of the Board of Trustees upon recommendation of the Faculty, three women have been matriculated for the degree of M.D. The Medical Library has been increased by 200 volumes through purchase and gift. The only important change in methods of instruction has been the systematic use of the case history method, and the results are most gratifying. Following the general policy of the University to require as thorough work of the part-time student as of the full-time student, the schedule of the Freshman class has been so arranged that next year it will not be possible for the part-time student to take all of the work outlined for the full-time student. The result will be that the part-time student will have to spend five years instead of four in obtaining the degree. From the number of inquiries received there will doubtless be a larger number of new students entering next session than heretofore.

DEPARTMENT OF DENTISTRY.

There were 10 students in the first year class, 22 in the second, and 18 in the third; a total of 50. All of these were pursuing the regular course. Fifteen members of the Senior class received the degree of D.D.S. on Commencement Day. Educationally the session was highly successful and the lectures and laboratories were well attended. The entire graduating class of last session were successful in passing the examination of the District of Columbia Board of Dental Examiners, and the report of this Board to the National Association of Dental Examiners was evidently flattering to the methods of instruction in this department. In the Dental Infirmary, under the direction of an assistant professor and corps of assistants, the instruction has proceeded with better results than ever before. The patients numbered more than 5000.

NATIONAL COLLEGE OF PHARMACY.

The number of students enrolled in the several classes was as follows: Freshmen, 35; Juniors, 16; Seniors, 19; special, 3; total, 73. Standards of admission to the College have been raised, and by degrees the College will fully conform with the educational requirements of the University for other departments. Two new professors have been added to the Faculty for the coming session.

DEPARTMENT OF LAW.

The work of the session just passed has been distinctly successful and marks a long step forward in working out the general plan to raise the department from the position of a mere local law school to that of a law school which may reasonably entertain hopes of becoming the representative American Law School. The total attendance in this deparment during the passing session was 366, distributed as follows: First year, 70; second year, 107; third year, 97; fourth year, 16; special, 17; patent, 23; review, 26; Doctor of Jurisprudence, 1. The decrease in the size of the first year class has been due to the putting of the work of the Law Department on practically a full-day basis, making it impossible for students in the Government employ to complete the course in less than four years, to the increase in tuition fees, to the marked raising of the standard of work required, and to the practical elimination of the old lecture method of teaching and the substitution therefor of the case system, which necessitates a much greater expenditure of time on the part of students and renders mere attendance without preparation comparatively useless. Hence this decrease in the number of students is doubtless temporary and the changes which have been made will inevitably elevate the character of the work done and enhance the reputation of the department locally and abroad. There are already many indications that the reputation of this department is rapidly extending throughout the country, and there is among the students an enthusiastic appreciation of the higher ideals towards which the school is striving. The Faculty consists of 17 members, of whom four are giving their entire time and attention to the University. The library has been increased by nearly 500 accessions through gift and purchase.

UNIVERSITY CONVOCATIONS.

The first Fall Convocation of the University was held in Memorial Continental Hall, October 17, 1906, at 5 o'clock p. m. The address was made by Professor Carl Beck, M.D., of New York City, on the "Influence of American Medicine and Surgery on Europe." This address appeared in the October Bulletin. Degrees were conferred upon eight candidates as follows: D.Phar., 2; LL.B., 4; LL.M., 1. The music was furnished by the University Orchestra.

The third Winter Convocation was held in the Belasco Theatre on Friday morning, February 22, at 10:30 o'clock. The address was made by Rev. Richard D. Harlan, D.D., LL.D., Past President of Lake Forest College, on "Municipal Patriotism." Degrees were conferred upon 9 candidates as follows: A.B., 1; M.D., 1; D.Phar., 5; LL.B., 1; M.Dip., 1; M.A., 1; M.S., 1; Ph.D., 1. The honorary degree of LL.D. was conferred on Mr. Oscar T. Crosby, of Washington City. The music was furnished by the Marine Band.

THE EIGHTY-SIXTH ANNUAL COMMENCEMENT.

On Sunday afternoon, June 2, the Baccalaureate services of the University were held in Memorial Continental Hall. The sermon to the graduating classes was preached by Rev. Dr. Richard D. Harlan from the text "I am the way, the truth, and the life."

The University Commencement occurred in the same place on the following Wednesday, June 5, at 10:30 o'clock. The University procession was formed at University Hall, and marched through Lafayette Park down 17th Street to the Memorial Continental Hall. The invocation was pronounced by Rev. Frederick D. Power, D.D., LL.D., pastor of Mount Vernon Christian Church, Washington, D. C. The Commencement address was delivered by Professor S. C. Mitchell, Ph.D., D.D., of Richmond College. The candidates for degrees were presented by the Deans of the respective Faculties to the President, who granted them their diplomas. There were in all 220 graduates, distributed as follows: B.A., 17; B.S., 7; B.S. in Chem., 2; B.S. in C. E., 4; M.D., 61; D.D.S., 15; D.Phar., 15; LL.B., 63; LL.M., 9; M.P.L., 17; M.A., 4; M. S., 1; Ph.D., 5. No honorary degrees were conferred.

Scholarships and prizes were announced by the Deans. Meetings of the Trustees of the University, Columbian College, and the Washington College of Engineering were held in the afternoon.

On Wednesday evening a reception at Rauscher's was given by the President and the Trustees to the members and friends of the graduating classes.

THE ALUMNI.

At the Fall Convocation, October 17, 1906, 7 degrees were conferred; at the Winter Convocation, February 22, 1907, 13 degrees were conferred; and at the Commencement, June 5, 1907, 218 degrees were conferred. Since its organization in 1821, the University has conferred 6850 degrees on 5438 persons.

The Secretary of the General Alumni Association, whose office is at the University, endeavors to keep a list of the addresses of all Alumni. His catalogue now contains the addresses of 3659 graduates. It is known that about 1100 are dead, and information is lacking in regard to the others. All Alumni are urged to keep him informed of any change of address or occupation, and to supply information in regard to their fellow Alumni.

During the year the General Alumni Association held its annual business meeting and reception at the University and on April 23 held its annual banquet at Rauscher's, which was attended by more than 100 Alumni. Mr. E. C. Brandenburg, President of the Association, was toast-master. Speeches were made by President Needham, Mr. Justice Anderson, Rabbi Simon, Drs. White and Carr, and Messrs. Mason, Richardson, and others. Several of the branch Alumni Associations in other cities also had annual banquets.

In furtherance of the efforts to raise a fund for a new site and for endowment, the General Alumni Association appointed an Alumni Committee to coöperate with the University Committee. Substantial contributions have been made by Alumni to this fund and it is expected that the total will be largely increased during the coming year.

STUDENT LIFE.

Foot Ball.—The season was begun with nearly all of last year's team on the field and a large increase of new material to draw from. The management was in the hands of Mr. E. C. Wilson, Medical '07, and Mr. E. M. Ball, College '08, Assistant. The efficient services of Mr. Wilmer G. Crowell, as Coach, gave the team a knowledge of the game that they have never before shown. Mr. Crowell was Swarthmore's captain the year before when that team made the most brilliant record in the history of that institution. He was a most capable coach, and, barring one or two mistakes, was the best instructor in the game that has ever been on the field, and should have made an enviable record with the team.

Mr. B. G. Steenerson, Law '07, was again Captain of the team, and in every game showed that he was as good an individual player as has ever worn the buff and blue. The schedule included eight strong games with heavier teams than the University has ever before attempted, some of which there was no reason to believe that George Washington could defeat, but the record was only three defeats, namely, Lehigh 6 to 0, Swarthmore 17 to 0, and Georgetown 16 to 6. The event of the season was the game with the University of Virginia, in which the wearers of the buff and blue played Virginia one of the strongest games of the year, the result being 0 to 0, the visitors being lucky to get off at that, for the local team clearly outplayed them. The Georgetown game was a great disappointment. The playing of our team had been such that there was every reason to believe that it would bring back a victory from Georgetown. The team did play a great game, but was demoralized by the sudden inefficiency displayed by a player in a most responsible position, on account of which Georgetown scored twice when it seemed easy to prevent it. Gallaudet was defeated 27 to 0; Randolph-Macon, 22 to 0; Western Maryland, 8 to 5; while the games with Baltimore Medical and Virginia were scoreless ties.

Financially the season was better than any preceding. All debts were paid and a surplus left in the treasury. The games were arranged with a view to saving expense in travel and bringing larger crowds to the home grounds. For next year Mr. Ball, last year's Assistant Manager, has been elected Manager, and has already almost completed next year's schedule, which includes as strong a list of teams as that of the past season. Mr. J. M. Gunning, College '08, has been elected to captain the team.

Base Ball.—The team met the most representative teams in the country, such as Yale, Columbia, Cornell, Syracuse, North Carolina, Virginia, and others. While the season cannot be called a success from the standpoint of victories, yet there was a marked step forward over the schedules of former seasons, a much higher grade of teams being met, and the sphere of action being materially widened. The management was ably conducted by Mr. H. Clay Willis, Medical '09, who took the team on a week's trip through North Carolina and Virginia. The Captain, Mr. S. H. Titus, was assisted in getting the team into shape by Mr. "Cy" Cummins, who proved a valuable coach. The sport was not as loyally supported by the student body as it should have been and some of the games were a financial loss, but the season as a whole was about as the preceding year. The two games with Georgetown were the closest and most interesting ever played between the two institutions, and their outcome was in doubt in each instance till the last inning. The first was lost by a score of 6 to 7, and the other by 1 to 3.

Track.—Although track work is very young at the University, yet the team this year made a remarkable record. It participated in meets of Washington, Baltimore, Norfolk, and Charlottesville, and won one or more first places in each. A team of nine men entered in the Charlottesville meet, and won second place in points, being a close competitor to the University of Virginia, which had a team of thirty-four men.

Lorando won first in the mile, the half, and the quarter, while Sterrett won the pole vault, and Gill the two mile. The inter-class meet was again held on the Van Ness track, and although the severe weather interfered with the runners, excellent records were made.

Basket Ball.—This game was played here for the first time this year, yet a winning team was put out. Interest was aroused at once, and the game will become a permanent feature of the University athletics. Two games were played with Georgetown and both were won by our plucky team. The University of Virginia was also defeated. A trip was taken into Virginia, including games with Washington and Lee, and other teams. Mr. W. P. Wood was largely instrumental in arranging the schedule and getting up the team. Mr. M. S. Biddle has been elected to succeed him next year.

Rifle Club.—The Rifle Club team won a notable victory at the National Shoot, at Seagirt, winning the beautiful trophy which was given to the winner of the Intercollegiate Match, and which was won by Princeton last year. A number of Eastern colleges participated, but George Washington was easily the best. A team will be sent to the meet again this summer. Mr. Jackson Morris has been very zealous in equipping and training the team, and to him is due the credit for the prominence given the University at Seagirt by its victory over the Eastern universities.

Debating.—The debating record of the University this year has been but a continuation of the most remarkable record in debating that any university can claim. The seventh consecutive victory was registered when the University of Syracuse was defeated during Commencement week. The six preceding, won during the last three years, were with the University of Virginia, Washington and Lee, two with the University of Cincinnati, Georgetown, and North Carolina. On March 1 of this year the University of Cincinnati was defeated in Cincinnati by a team consisting of Messrs. Agnew, Gates, and Allen; on April 12 the University of North Carolina was defeated by Messrs. Couden and Hindman; and on June 4 Syracuse went down before Messrs Gates, Kennedy, and Baer. It is noticeable that the University has not lost a debate since Professor Veditz assumed charge of the debating interests here. To his skill in training the debaters is due much of the unrivaled success of the University. There have been five public debates between the societies of the University, the Columbian winning two from the Needham and the latter winning one from the Columbian and one from the Enosinian. During Commencement week the final debate was held between the honor men of the preceding four debates.

Publications.—During the past year the student publication, *The University Hatchet*, has been placed under the control of a Board con-

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sisting of two members of the Faculty and five students, which elects the Editor and the Manager in May of each year, and has entire charge of all affairs of the paper. Steps are now being taken to complete the incorporation of the Board. Its members are Professors Carroll and Vance, of the Faculty, and Messrs. R. I. Moore, A. J. Russell, E. P. Gates, L. H. Call, and E. C. Wilson. During this year the Editor-in-Chief was Mr. R. I. Moore, and the Manager, Mr. A. J. Russell. The Board has elected Mr. E. P. Gates and Mr. F. C. Allis, Editor and Manager, respectively, for next year.

The Mall of 1906-07, which appeared in May, continues to uphold the high standard of former editions. Mr. K. M. Block was Editor, and Mr. J. R. Biggs, Manager of this volume. The Association of Class Presidents has elected Messrs. L. H. Call and E. D. Everett, Editor and Manager of next year's book.

Y. M. C. A.—The Young Men's Christian Association has become firmly established in the University, chiefly through the untiring efforts of Mr. Ernest Eaton, aided by the support of Dean Wilbur. Last fall a notable gathering assembled at a dinner in the city Y. M. C. A. building, and listened to stirring talks by the world-renowned speaker, Fred B. Smith, and others almost as widely known. The Association had the honor of entertaining in its halls in April the largest gathering of Y. M. C. A. men and students ever assembled in this city. More than six hundred from all parts of the city came together to hear and meet Fred B. Smith, who has taken a deep interest in the Y. M. C. A. of the University.

The reader may feel inclined to contribute to the realization of the objects of the George Washington University Movement. If so, will he kindly fill out and tear off the form given below and mail it to the Chairman Committee on Buildings and Endowment, The George Washington University, Washington, D. C. If he wishes his subscription to go to some particular object, or desires further information, or would like to confer with a representative of the University, the Chairman will be glad to enter into communication with him.

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To secure the sum of four hundred thousand dollars to be applied by the trustees toward the purchase of grounds and buildings, and the enlargement of the educational work, and in consideration of the subscriptions of others, I will pay to **The George Washington University**

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October, 1907

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Bulletin

OCTOBER, 1907

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EDITORIAL NOTE.

THE GEORGE WASHINGTON UNIVERSITY BULLETIN is published four times a year, under the editorial supervision of the Board of University Publications, appointed by the President's Council. It is the purpose of the Council to make the BULLETIN an organ of the educational and scientific activities of the University. The University Catalogue constitutes one number. Others are devoted to information of special interest to the Alumni and patrons of the University. Scientific numbers are published from time to time containing contributions from instructors and graduates and information regarding books, monographs, and papers published by them under other auspices.

The present scientific number is devoted to the Faculty of Graduate Studies and especially to the departments of arts and literature. A number of papers from members of the faculty and abstracts of theses accepted for higher degrees are presented. It contains also notes bearing on investigations and researches made by instructors; announcements of recent appointments, and miscellaneous items of University interest. The Board desires to be kept informed as to the academic record, publications and professional appointments of instructors and graduates in all departments of the University. Communications may be addressed to the Chairman.

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The George Washington University
BULLETIN

VOL. VI. OCTOBER, 1907. No. 3.

"PHLEGM *VERSUS* FRENZY IN SOME CURRENT DISCUSSIONS."[1]

BY E. BENJAMIN ANDREWS, D.D., LL.D.,
Chancellor of the University of Nebraska.

With all its good, which far outweighs its ill, the free press that we in the United States enjoy often works great harm. Non-occurrences are reported as facts; facts are misreported in every possible way. Statements are garbled. The fables pass from reporters to editors.

Newspapers and magazines rarely eat their words, so that these "fake" reports and editorials are far and wide accepted as if they had solid basis. Such fabrications not seldom damage reputation or even, in the eyes of many, ruin it; but, if they do not provably involve libel, the injured parties have no redress.

If one suffering so cares to deny the false allegation, the paper first guilty may possibly publish what he says; but, as others will not, the lie travels on and on. Should he fail to protest, the utterance is set down as true and just. Silence is viewed as a plea of "guilty." The man is outlawed. Paragraphists guy or butcher him as they list, till readers weary. If he has reputation, or if the doings or sayings ascribed to him are "hot stuff," as the reporters phrase it, the *canard* goes the round of the press, and then out and back and out and back again, like an echo, save that the reverberations add to the original bruit instead of dying away.

When the statement is clearly libelous if true, yet the libelee does not prosecute, then, nearly all agree, he must be guilty. Doubt is no longer possible. But doubt is quite possible. The libeler may be so worthless that beating him would mean nothing but an empty judgment. And if you collected damages, what requital are a few hundreds or thousands of dollars, not enough to pay your attorneys, when lies about you have been reiterated in the press till half your countrymen think you a monster! A proved libeler in a case of that kind deserves to be hung.

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[1] Extracts from address delivered at the Fall Convocation of The George Washington University, in Belasco Theater, Wednesday morning, October 16, 1907.

It is the crowning baseness of our time—which is saying a good deal—this selecting for victim some character so distinguished as to assure piquancy and a market for your inventions, and then, craftily avoiding suable libel and relying for fuller protection on the victim's known kindliness, industry and dignity, proceeding to vivisect him for pay. None of the business villainies alleged to be so rife could compare in atrocity with these squalid campaigns of libel and libelous caricature which recent months have produced.

Although blackwash is rather more offensive than whitewash per square inch, still, if the blackwash could be confined to the faces first touched, protest would be less in place. But blackwash spreads much worse than whitewash. All know, and the detractors themselves admit, that those they arraign are in principle no worse than others; that the deeds and methods denounced prevail throughout the business world. At times, the critics themselves lay the whole fault impersonally to "the system," yet they are inconsistent enough to keep on berating individuals. If their complaint stands the entire business public is smirched.

I join any man and praise all zeal in ferreting and rooting out real wrongs. What I plead for is discrimination. An old scripture says: "Woe unto him that calleth evil good, *or good evil.*" Blackwashing is as wicked as whitewashing. Hew to the line, by all means, but not through it. Let no guilty man escape; let no innocent man be put in prison or under ban.

A stand against the indiscriminateness of much current criticism seems to me a public duty. Justice and fair play demand it. The hue and cry endangers vitally needed legislation. Evils do exist, some of them portentous.

Criminal misuse, for personal gain, of both public and private trusts has been found to be too common. Dishonest promoting is not rare. Gambling speculation is rife. Taxation is grievously unjust. Legislation is bought and sold. Our laws favor too much the idle wealthy. These and such are society's desperate ills. If we are not rid of them the state cannot remain free. Incomparably the saddest aspect of our case is that these abuses have grown up in the midst of democratic communities. If the people cannot learn to administer better they will sometime in their disgust renounce the task.

Congress and legislatures are astir. New attempts will occur early in every law-making body throughout the Union to promote fair dealing and to repress fraud and graft. But there is perilous possibility that the efforts will vanish in smoke because of so much unreason in the call for them. Bills will be killed in conference or else enacted but found inefficient or positively baneful. Your honorable committee sets out to draft a reform measure and gives hearings. Exaggeration, misjudgment, anathema, wind have the floor at every session. Members conclude that as most of the allegations are false, extravagant, or vague, the real ills must be few and inevitable. Whereupon your committee either reports no bill at all, or, if owing to the clamor it is felt that something must be done, a bill reading fairly but calculated to breed infinite litigation without the slightest advantage to any. If I were a wicked Croesus, bent upon lucre at any cost, as our very wealthy are by many supposed to be, and were scheming for continued immunity in grinding the poor, I would pay agitators royally to keep on charging against capitalists all the woes men suffer. Such moneys would be the best investments I could make. In no other form is wealth now doing so much to perpetuate the abuses of wealth as in publishing the Hearst newspapers.

No one pretends that business morality in the United States is spotless. It has most regrettable shortcomings. Leaving out of the discussion ordinary human frailty, which is of course presupposed, and the cases of clear criminality which all alike wish punished, the faults proceed from two sources. One of these is the filthy lucre mania now gaining fresh strength. Friedrich Nietzsche with his anti-gospel, that might is right and unselfishness the religion of slaves, has won more of a following in twenty-five years than Christ secured in five centuries. The sense of honor has fallen, not alone in commercial walks but among all classes. Clergymen, professors, orators, senators, and business men generally, no less than Wall street operators prize material welfare too much relatively to the things of the spirit. All admit and deplore this; and it is to be hoped that even the ugly diatribes I am noticing may, in spite of their bad temper and exaggerations, help pump oxygen into the moral air.

But most torts in contemporary business have source outside of men's cupidity. I ask special consideration to this.

Thousands nurse the hallucination that morality is not only an exact but an *a priori* science. The common view seems to be that men's intuition, or the Bible, or some other accessible repository, contains a detailed register, a sort of moral nautical almanac, where any man can, by consulting the index and then turning over a leaf or two to find the proper line and column, obtain an absolute answer to every moral problem that can be raised. It is supposed that no one need ever do an anti-social thing, and that none ever so transgress save with evil purpose. Why should you go queer in business when an exhaustive moral code, covering all business as well as all other relations and conduct, always awaits your consultation? If you do wrong your heart must be corrupt.

In fact the case is far less simple. In the business perplexities of our day one cannot by just pushing a button have the right answer brought in on a tray by a servant. Concrete morality is no rule of thumb affair. Like law and medicine it is an inductive product, its solutions requiring not only deep and patient study but, often, long experience individual and social. Our traditional code itself is the result of such experience, a thousand generations in the elaboration.

Nor is right action in our complex business matters a mere function of a good heart. An instructed mind is essential. We must trade to-day and to-morrow, traffic and bank, build, ship, hire and let as decently as we may, but whether or not our procedure in all this exactly tallies with the greatest good of the greatest number none can certainly know till we have observed decades longer. All present judgments in the premises must be tentative, and, if you curse your neighbor for doing thus or so, your reproof is as likely to be wrong as his act.

I speak, in the main, of problems presumed to be ultimately soluble in the sense that they can by and by be referred to determinate rules.

Another class of questions arises which can never become determinable in that sense; never be referred to any principle, because no principles for them can ever be worked out; questions, therefore, which must forever be answered by the higgling of the interested each at the time it arises.

Suppose Elihu Root declined to be Secretary of State for $8000 a year but consented if we would pay him the worth of his services. What should the figure be? The sum he could earn practicing law, said to average $1000 a day or $313,000 a year? Or should he rebate something for the honor? If so, how much?

The prices of monopolized articles, on the theory that competition ought to fix prices, since competition no longer exists in these articles and no one can say what prices it would fix if it did exist, are subject to no principle whatever save the tolerance of the market.

And in many lines of business where wages or prices are determined by some rule, as supply and demand under competition or the tolerance of the market under monopoly, the rule has no rigidity, but illustrates, rather, what Walt Whitman calls "the eternal float of solution."

Into this vast murk of enigmas gaily trip our new moral instructors with their cockshure solutions but no other credentials, ignorant of serious ethics and of economics, weak on logic and often confessedly prejudiced, yet launching anathemas right and left as no infallible Pope ever did. This man sold so; that one shipped so; the other kept books so; rogues all; grill them; away with such fellows from the earth! We create over night categories of sins and next day use them to consign men to perdition as coolly as if we were applying the decalogue itself.

We incessantly confuse impropriety, impolicy and unwisdom with fraud and crime. Instance any of the famous investigations which have been or are on foot. Comparatively little that managements are blamed for has been criminal or even illegal, though overmuch has been impolitic and of evil tendency and deserved rebuke and correction. Most of what is illegal is so simply by yesterday's statute.

Another gross error is that of blaming persons, when fault, if any, attaches to human nature or to society.

When you call it "unjust" that one man should own $1,000,000 instead of 1000 owning $1000 each, what you mean is, no doubt, that you regard it a pity the world is so put together as to permit such inequality. You are wild to lay the fault to a man or body of men, or to legislatures, courts or Congress.

The new preachers continually play upon and intensify the prejudices of those with whom it hopelessly damns a man that he is wealthy. The poor, the vast majority of us, naturally hate the rich. Among the have-nots a fellow who begins to accumulate gets with his dollars the cold shoulder from his mates. The better-off he becomes the greater his isolation. Moderate possessors ostracise similarly any of their number amassing thousands; the holders of thousands, the winners of hundreds of thousands. Spite of all this a voice will now and then be detected calling you a worthy citizen till you turn millionaire. Then you are a reprobate. It would seem to be the practically unanimous view among plain people that no man alive can own a million dollars and be honest. Ten or a hundred million stamp their owner as a criminal with nearly all.

I hold no brief for any among the rich. I care not a straw for the rich as such. My interest and sympathy is solely with general society and the common man. And, speaking as a representative of the public at large I urge that the pride, idleness and doubtful practices of a few rich are no just cause for putting all rich men in pillory. The possession of wealth, however great, furnishes by itself no presumption against the owner's perfect probity.

If a man can fraudlessly become possessor of ten thousand, he can, if he works on with the same zeal, skill and power, not only as easily but more easily, secure a hundred thousand, two hundred thousand, five hundred thousand, a million, a hundred million.

Just here financial geniuses find opportunity. Now and again rises up amid the common throng of business men one with the ability to utilize to the end that semi-automatic power, to set and keep his hundreth million earning with the same precision governing his first investments. In ever new directions he continues foreseeing what the public or mankind will want and equips himself to cater and reap accordingly. He hunts out new markets and scrutinizes old, buying in the cheapest and selling in the dearest. He reforms modes of production, of distribution, of exchange and of transportation in his trade.

He scents the commercial meaning of scientific discoveries. He finds out what is going on in far lands. A world's openings for wealth-getting reveal themselves to him, which he enters, partly because no one else knows of them, partly because he is surer than others touching their value, and partly because of his greater resources. He combines industry with industry and effects saving. He takes advantage of rivals' errors and hesitancy. He can select and manage men. Titanic endurance enables him to keep a thousand irons in the fire at once. So long as such gifts remain in exercise the man goes on creating wealth at an ever accelerated pace. If he becomes a billionaire you have no right to denounce any part of his fortune save upon proof of fraud. The mere fact of his being so rich is naught but a proof of his genius and his industry.

Should a billionaire arise it would be no mystery; the mystery is that billionaires are not already present in some number. The explanation, aside from the rarity of genius, is to be found in this, that after a man has won some millions the initial spur to wanting, the desire personally to have, use and enjoy large wealth, ceases to prick. A man with two million can never in his life be practically any richer. He has all that he can personally use, even for display.

If such a man nevertheless keeps on acquiring it must be for the name of possessing extreme wealth, a rarer motive, I believe, than most of us suppose, or out of habit, to vent a native or acquired need of activity; or, that he may do mankind good. For, be it remembered, the creation of new wealth in the world is always a high form of beneficence. I am of the opinion that a considerable number of our very rich men make money not to multiply their delights or to procure renown, but to advance human happiness. When such a man continues working after others retire, it betrays not greed but philanthropy.

The multimillionaire certainly, like dynamite, will bear labeling and watching. The energy stored in him is vast and may explode to lay things waste. But are you going to order out of the country all men and substances deemed dangerous? No Dewey more? No giant powder? Part with Roosevelt, Niagara, electricity? The destructive ability of these agents, if they go off at the wrong moment or in a wrong way, is absolutely frightful. The most dangerous object any nation can own is a general like Napoleon. What would not Russia give for so valuable a peril now? A nation's deadliest peril may lie precisely in her freedom from a given peril.

I cannot take so seriously as the excellent Judge Grosscup seems to the gathering of wealth-titles into fewer hands, which, to my thought, means, in the main, simply a more efficient administration of the country's productive machinery; nor do I anticipate any plethora of the very wealthy.

Not only can we stand multimillionaires but our growth in civilization, as things are, demands them. When you have perfected that scheme of yours and reconstituted society, we may get on without them; now they are a necessity. So long as the initial craving for wealth, the love of it for personal uses, is strong upon men, they are not generous. Suppose the total wealth of the United States as great as now but no multimillionaires owning any of it, only millionaires, the lesser rich and the greater poor, is it for a moment supposable that art, education, religion, hospitals, reform and relief work at large, and scientific research would be provided for either so wisely or so munificently as now?

There are to-day millions of American dollars whose interest is used for extremely recondite but most desirable investigation touching the history of our country; other millions supporting medical research calculated to lessen pain and disease and prolong life; and other millions still assisting poor farmers to till their soil productively; which millions, even if they existed, would, to a practical certainty, not be performing such invaluable services had not a few benevolent men become extremely rich. Congress would never have voted money for these ends, nor would people of moderate means ever have contributed.

Another office which, at present, only the multimillionaire can fill is that of the adventurous investor. We vitally need such investors, we always shall need them, and the need must become more and more imperative. In one voice we are calling upon directors to stop making hazardous investments of trust funds, and upon all multimillionaires to abdicate. The cries are incompatible.

I call attention to the fact that nearly all the real evils now popularly denounced proceed from corporations. Managers are in effect forced to be hard. To keep their positions they must make dividends. Dreadful pressure is upon them to effect sales, and to reduce expenses in every way possible. Adulterations, dangers to work people, child labor, unjust cuts in wages, fraudulent promotion and capitalization originate in the awful urge that is upon managers to grind out profits by hook or by crook.

The joint stock method of business is no doubt to a great extent a necessity and a fixture. Massive industry to-day calls for the corporation and will long and perhaps always continue to do so. But its evil might be diminished by the multiplication of men rich enough to own great businesses and talented enough to be their own managers, dealing directly with their help and with the public.

As I predicted in '89, nearly all the staple commodities dealt in by the American people have become subject to monopoly. They are no longer produced or sold competitively, as earlier. This installation of monopoly has brought or helped bring a rise in nearly all prices. The advances since 1880 are not due to this cause alone, but most of them are partly due to this cause. Whereas, before, consumers were, because of competition among producers and sellers, able to purchase goods, as a rule, at an inconsiderable advance on cost, now, a broader law regulates most prices, that of the tolerance of the market, the price of any commodity tending to go up to the point affording the maximum from sales, to such a point, in other words, that, were it to rise higher still, the falling off in sales would cancel the gain from the increased price.

Now this reign of monopoly was not ushered in by any one man or set of men, or through legislation or in malice. It was an inevitable evolution, not less natural than the preceding *regime* of competition but, of the two, rather more natural than that. It may easily work net good, increasing wealth, which is always a gain for all and not merely for those first benefited. Ranges of business ability and of morality itself may be called out by it higher than the old order could have produced.

When a form of industry stands years long, in face of every vicissitude, outliving all sorts of crises, antagonism the most bitter and competition the most intense, whatever it may owe to individual volition and agency, real and sad as certain hardships it entails may seem or be, even if it has to be ripped up for the sake of some better form, it cannot be called arbitrary. It is an economic creation, falling in with the material, political, social and personal factors which exist and cooperate at the time.

All deem wages just however high. Nearly all the price-advances which monopoly has produced are acquiesced in by the public. Complaint continues only in respect to a few articles, but it can easily be shown that the more or less recently advanced cost in these cases is due to precisely the same causes affecting the cost of our living at every point. It is more and more seen that no soundness attaches to competitive prices. Price-fixing by competition is not a fundamental operation, parallel with price-fixing by market-tolerance. It is only a special case of market-tolerance, this latter being the general phenomenon and competition a special form of it.

Are consumers, then, in respect to prices, at the mercy of dealers? Can they charge us whatever they please and must we pay or go without? Not at all. Relentless as is the law that while monopoly lasts the price will stay near the tolerance of the market, dealers charging you all the traffic will bear, equally inexorable is the law that no price can stay above this limit. Suppose silk hats, under competition, sell at $6. Combination may force them to $6.50 or $7; but no power on earth could drive them to $10. Let sellers find that a price is so high as to block net profits, you need no legislation or consumers' league to make them come down.

Wealth got by advance of prices, though it may make consumers poorer in the first instance, and a given individual *permanently*, can't otherwise than momentarily impoverish the general public: for the most of it is at once invested and at once begins to support industry again.

Of course, those newly (or more) enriched will spend *part* of the gain in personal ways, non-productive, but it could probably be established:

1. That the proportion of non-productive expenditure to the total of any society's wealth is less and less as the proportion of wealthy people increases. It is greatest among poorer people.

2. That it decreases in proportion as the wealth of the wealthy passes into fewer hands, i. e., as the wealthy become *very* wealthy.

Suppose Mr. Pierpont Morgan worth $500,000,000. His non-productive expenditure is not greater than that of most millionaires. Then suppose his wealth distributed to 500, the idle expenditure would be multiplied by 500. If it is $1000 a year in his case it would be half a million by the distribution.

The folly of popular judgments in these matters appears clearly in the fact that the rich who are railed at are in all cases the productive and useful rich, demonstrably benefactors of mankind on a colossal scale, and never the idle rich, who, however legally, and to a certain extent, perhaps, properly, live at the public expense.

People of great wealth form three classes. One consists of those who create their wealth. These, with all their faults, are desirable citizens, a blessing to the nation, not mainly for what they give away but far more because of the resources they provide, in the way of new wealth, for the honest self-maintenance of many engaging in business on their own account or earning salaries or wages. This extension of opportunity always attends the origination of wealth.

A second class of the wealthy embraces those who earn or create nothing in any usual sense of the words and are therefore in the main dependents, yet not quite wholly so, because of the good judgment they display in the choice of their business agents and investors. This last is an advantage to the world so far as it goes, because all of us are interested in having wealth, by whomsoever owned, wisely instead of wastefully employed.

A third class of wealthy persons have not even this claim to public esteem, as they earn or create absolutely nothing, even the agents handling their wealth being selected by others. These wealthy are utterly non-productive. So far as their wealth is concerned, they perform no social service whatever. Economically the public would be better off if they were dead. Socially they are hangers-on pure and simple and producers or helpers in no sense or degree whatever.

This does not necessarily mean that the non-producing rich should be arbitrarily suppressed. They are somebody's children or friends; and a law to exterminate such and prevent their existence would probably repress to some extent men's zeal in begetting wealth, which would be a great misfortune. Probably a heavy death and inheritance tax is as far as the state could safely go at present in keeping down these undesirable citizens.

It may be urged that wealthy persons of my second and third classes are often benevolent, but this is no argument in their favor from a social point of view unless there is reason to suppose that men and women not earning their wealth are more benevolent than those who earn. I know of no evidence to that effect. The fact is probably just the reverse.

Is it not clear that if we must inveigh against any of the rich, we ought to select the third, utterly unproductive set, or the second set, mainly unproductive, instead of those who not only pay their way but help the rest of us pay ours? The productive rich may do wrong in various ways, and if they do it is a pity, but they are not undesirable citizens, they are not a drag on us, while the non-productive are precisely that.

I beg to point out here the utter error of the assertion so often made, that a rich man's wealth is, by the fact of his owning it, "taken away" from the masses. An idle man's wealth, except the part that he personally uses, is not by any means removed from the office of benefiting and sustaining his neighbors. Even the personal part, in the very act of being spent, assists to a slight extent in maintaining labor.

We cannot be too often reminded that wealth, in whosesoever hands the title may be, cannot exist without employing labor, contributing to industry, helping people get their living.

Popular writers, and even professional economists, almost always ignore the vital distinction between the distribution of wealth and the distribution of titles to wealth. We shriek in horror that wealth is becoming dangerously concentrated, when all we mean is that the ownership of much wealth is coming into fewer hands. The fact is that as to its essential efficiency and helpfulness, wealth inevitably distributes itself. The ownership of wealth may vest in few or in many; the good of wealth tends to spread to all.

Suppose socialism. Then the people as a great public person would own all land and capital, as they now own all post-offices, naval ships and public lands. Proprietorship would be single—a one-person affair. But would not the good of the nation's wealth spread to all? Socialists contend that their system of single ownership is precisely the one under which the essential good of wealth does spread to all. I maintain that in socialism we should have painfully less wealth than under a just system of private initiative and surveillance, but, in alleging that wealth as to its titles may be massed and as to its service very perfectly distributed, the socialists are quite right.

A wealth-owner may be never so hoggish: he may care nothing for any one save himself, and raking the muck simply as convenient exercise for giving play to his motor nature. We are sorry: we like him less. He will devote a larger percentage of his winnings to vast expenditures and be less keenly awake to the just demands of benevolence. So long, however, as he piles higher the social store he is a valuable citizen. He is helpless to serve himself with his resources and not serve others at the same time. Suppose him to turn all his property into gold and have a celebration in dumping it into the sea. He must pay agents or banks to convert it and barrowmen to wheel it. Fortunately, greed itself insures against such folly and the unjust as well as the just prefer investment to destruction.

Benevolence may become socially dangerous like avarice. No man's wealth to-day is more active in social helpfulness than Mr. Carnegie's; but this is probably less true of what he gives away than of what he keeps. His sagacious investments, past and present, are no doubt his best boon to the public.

A prime question always in scientific benevolence is whether money in the form of a library, a church, a college or a gift to a missionary treasury will conduce to the weal of mankind as much as the same sum left invested in trade and employing labor. Donors often err in this matter and actually hurt society by their benefactions. Wealth engaged in carrying on the world's business is always useful. It matters comparatively little who owns it; it is helping you and me, the middle classes generally, and the poor.

I maintain in spite of all the assertions *contra* one hears now-a-days, the unconscious and the conscious socialism and communism that gets itself voiced on every hand, that the production of wealth is still the greatest factor in human progress, towering in importance above every question touching the distribution of wealth-titles. Titular distribution of wealth is more or less important. I wish proprietorship were more evenly passed around. I hope it will one day be so. But I should rather submit to almost any form of wealth-distribution than to the slightest falling off in the amount of the wealth created. Let wealth in mighty and ever-increasing volumes come into existence, swell and spread: humanity cannot but flourish fairly. Whereas, if production declines and the dividend falls off, infinite haggling over distribution, even if successful, will leave us a poverty-stricken people.

LEGAL EDUCATION IN THE SOUTH.*

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During several recent meetings of this Section, and of the Association of American Law Schools, discussions of unsatisfactory educational conditions have been unnecessarily and unwisely localized. Low standards prevailing in the law schools of the States south of the Potomac, and the lack of adequate restrictions upon admission to the bar in those States, have been examined and set forth with a particularity and commented upon with a degree of candor that seem to indicate an abiding interest. This interest, however, would be more gratifying to Southerners were it not that sometimes the discussion has taken on that note of criticism arising out of superior wisdom and righteousness that used to characterize the discussion of the negro question a decade or so ago, before our friends in the North had come to realize that their Southern brethren were struggling as best they could under adverse conditions, but with all honesty of purpose, to solve an almost hopelessly difficult problem, best understood by themselves. So in these discussions of legal education and admission to the bar, it has been charged, by inference, that the Southern people are indifferent to the character and efficiency of their bar, and that those in charge of Southern law schools are not only lacking in foresight, but are without proper ideals, and for the unworthy purpose of attracting students who will pay fees from which salaries may be received, require little or no preliminary education before admission and an insufficient period of legal study before graduation. Certain crude utterances, indicative of an unhappy combination of ignorance and complacency, have been quoted from the proceedings of Bar Associations in Southern States as if they were representative of the sentiments of the members of the bar of the States in question, or as if such exhibitions were confined to the States south of the Potomac. The Southerners, also, dimly conscious of the dispute of '61, are perhaps a little too ready to take offense at candid utterance, and to stand aggressively on the defense. These precedents make the title of this paper "Legal Education in the South," an unfortunate one, as it seems to arraign the South upon the charge of general delinquency in matters pertaining to legal education, and to force the writer to present a brief for either the plaintiff or the defendant, and to put the whole discussion upon the plane of advocacy rather than of fair consideration and impartial judgment. Discussions of such character are relatively without value, and the point of view must be rectified. Hence I am entitled to this preface, which is quite like other prefaces, in that it has nothing particularly to do with the subject, but unlike the others in that it will be read—since I shall read it myself.

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* An address delivered before the Section of Legal Education of the American Bar Association, at Portland, Me., August 27, 1907.

The figures that I shall use are taken from the recently issued advance sheets of the Report of the Commissioner of Education. These relate to the session of 1904-05, and, therefore, do not present exact conditions of to-day, but the difficulty of securing from current catalogues sufficiently complete statistics to serve as a basis for reasonably accurate generalizations, has proved insurmountable. Indeed it seems to be peculiarly difficult to secure complete and accurate information concerning law schools. The inquirer too often receives from officials either no reply at all, or general remarks instead of specific facts. While the statistics reported by the Commissioner of Education for the session of 1904-05 are by all means the most nearly complete obtainable, they are yet far from being complete, or accurate in all respects, as anyone may perceive by examining the figures relating to any institution of which he has personal knowledge. Therefore, in presenting to you the figures that I shall later make use of, I would not be understood as holding them out to be any less unveracious than figures usually are. Inspection of many recent catalogues justifies the conclusion that the number of law students in the United States has increased nearly 10 per cent during the two years that have elapsed since the year covered by the Commissioner's report, and that this increase is remarkably evenly distributed over all the States. Hence we can, in general, by adding 10 per cent to the figures used, arrive at results approximately representing the conditions existing at the present time.

I also wish to explain that when I speak of those law schools belonging to the Association of American Law Schools as superior schools, and those not members of the Association as inferior, I do not mean to say that I think that every school within that Association is better than any one without it. Such is not the case. In fact, there are a few schools in the country—like that of the University of North Carolina—which are fully eligible to membership in the Association but voluntarily remain out of it because unwilling to surrender in the least degree their unrestricted right of self-control. Further, no impartial man having knowledge of the matter can have any question but that the graduate of a two-years school of the type—let us say—of the University of Virginia, with its faculty of able and experienced professional teachers, its high standard both of scholarship and ethics, and its remorseless examinations, is far better trained for a useful career at the bar after two years devoted exclusively to exacting study of the law, than is the graduate of the night-school, who during a period of three years, gives the fag-ends of days spent in earning a livelihood, and the remnant of his strength, to the study of the law. Yet the latter school may be a member of the Association, while the former is ineligible. Nevertheless, there is a strong presumption that the school which lives up to the standards set by the Association is distinctly superior to the one that does not, just as there is a strong presumption that the young man who has an A.B. degree is better qualified for the successful study and practice of law than the one who has not, however contrary that presumption may be to the facts in any individual case.

Again, I shall have occasion to refer to night-schools as essentially inferior. I do not wish, however, to be counted among those who regard the night-school as inherently bad, and think there is no place for it in a properly developed scheme of legal education. While it must be admitted by all that the student who is under the necessity of giving a large portion of his time to other employment, whether it be in a law office in Chicago, the Government service in Washington, dining-room service at Cambridge, or playing football at New Haven, is seriously handicapped, and cannot, on the average, possibly accomplish as much in the great field of the law as his more fortunate fellow who can give all his working hours and his undivided strength to his legal studies; yet there are unquestionably many young men of high character and fine ability, well fitted by nature to be ornaments to the profession, whose circumstances are such that they cannot qualify for admission to the bar unless their studies may be so ordered as not to interfere with the primary necessity of earning at the same time a livelihood for themselves and possibly for others dependent upon them. For such students the night-school is a blessing, and should not be discouraged. Furthermore, actual experience shows that a surprisingly large percentage of the students in the better class of night-schools are men of more than average maturity and ability, possessing much more than the average power of concentration and determination to succeed in spite of all obstacles, and these men use so well the scraps of time left to them for legal study that their acquirements are out of all proportion to the amount of time available to them—and they do, as a fact, often emerge from a relatively thin course in a night-school better equipped for winning the highest success at the bar than many others who have all their time free for study, but use very little of it in that way. But it must not be supposed that such exceptional men succeed because of the instruction in the night-school. They would succeed with any kind of instruction. They belong to that class of men who are born to be lawyers, and who would train themselves for successful practice, if need were, without the night-school or any other school or instructor, with one law-book and a tallow dip or a blazing pine-knot, perhaps—a class that has furnished so many brilliant self-trained judges, lawyers and even law-teachers, whose names adorn the history of the American bench and bar, and whose example has done so much to inspire eloquent protest in legislatures and Bar Association meetings against needed raising of standards for admission to the bar and right progress in legal education.

These exceptional men may well be left entirely out of our calculations when regulations are being established to govern the great mass of average men who desire to enter the legal profession. The poor young man who is predestined to become a great lawyer will as certainly surmount the obstacles which Examining Boards may set before him, as did the great self-trained lawyer of the past the even more serious difficulties that stood between him and his inevitable calling. But as for the average young man who works all day for a livelihood, the candid man must admit that the night-school can do little more than transfer to him such a knowledge of the law as a trade or handicraft, as will enable him to pass a bar examination. Therefore, the night-school would seem to be an inferior element in a progressive system of legal education, though possessing its proper function.

With these prefatory remarks concluded, we are ready to consider "Legal Education in the South." The reason why we consider legal education in the South, rather than in the West, or in New York, or Indiana, is because there is so little of it in the South, and that is supposed to be of such poor quality. On the surface this supposition seems to be well supported by the facts. In the whole country there are some 96 law schools which are in actual operation, and of such character as to possess significance as elements of our general educational system. Of these, 25 are in the 14 States south of the Potomac, including Texas, Arkansas and Oklahoma. The weakness and poverty of these schools in the South are pitifully apparent upon an inspection of the report of the Commissioner of Education referred to above. The average attendance at the Southern schools is only 59, while that of the 71 schools in the other States is 187, more than three times greater. On the other hand the average number of graduates reported by the Southern schools is 18, or 30 per cent of the average matriculation, while in the other schools the number is 15, or only eight per cent of the matriculates. The percentage of graduates in the South is largely increased by the relatively large one-year schools at Macon, Ga., and at Lebanon, Tenn., more's the pity. The average number of books in the library of the Southern law school is 1615, while the average number in the libraries of the 71 other schools is 7580. The professors in the average Southern law school, excluding assistants and lecturers, number three, while in the average school of the other States there are nine such professors. The returns as to revenues of law schools are too incomplete to be of much value, but the aggregate of reported revenues of Southern schools, $48,448, as compared with $677,317, reported by the other schools, is very suggestive.

To continue in figures the sad story of legal education in the South, we note that only two of the 25 Southern schools are members of the Association of American Law Schools, while 33, or nearly one-half, of the other schools are within its membership. In the Southern States there are only four three-year schools, and these are confined to the two States of North Carolina and Texas, while in the other States 50 such schools are to be found. In the South the States of Georgia and Tennessee have the bad eminence of furnishing, one each, the only two schools in the United States so disregardful of public sentiment and of duty toward the public, as to graduate students in law after one year's work. Nothing more meretricious and more reprehensible than the course of these schools can be discovered in the history of modern legal education, except that of the two-year night-schools in New York City and in other large Northern cities.

Of the 96 law schools under consideration 32 impose practically no educational requirements for admission. Of these 19 are in the South, and only 13 in all the rest of the country. When we have added that only eight of the Southern States require candidates for admission to the bar to be examined in writing before a State examining board, that only four require a fixed term of preliminary legal study and only two any preliminary general education, and that the admission-on-diploma heresy has full sway in all but four, the case against legal education in the South is completed. As thus shown, it is bad enough, and seems to justify the uncomplimentary things that have been said about it before this body and elsewhere.

But let us examine the facts further, and I think it will be seen that however bad are the conditions in the South they are relatively not worse than in many other States of the Union, and that however properly we may endeavor to stimulate our Southern brethren to more rapid progress in raising standards of graduation in the law schools, and of admission to the bar, any localized charges of peculiar indifference to the public welfare or of low professional ideals, made against the bar or the people of the Southern States, are without justification. These damning figures which we have been examining have another and very different story to tell. Thus it appears that only two of the 25 Southern schools are night-schools, while 26 of the 71 other schools are of that class. With very few exceptions the professors in these Southern schools have withdrawn from active duties on the bench or at the bar, and devote their whole time and energy, every day in close personal contact with a relatively small body of students, teaching the law and the reason thereof, and inspiring in the young men who come to be their friends, a warm and zealous love for and appreciation of the best traditions of a noble profession. In many of the other larger schools of the North and West, particularly in the night schools in the large cities, the personal contact of the student is confined to the treasurer who gathers the harvest of fees, and the monitor who inspires in him a very natural zeal for the noble art of cheating on examinations, while too often the interest of the professor in the school and in the students is proportioned to the one or two hours a week which he steals from the exacting duties of a large practice or of a bench cumbered with records, and even in this year of grace, 1907, is sometimes manifested by the reading of typewritten lectures to an outworn class.

The population of the Southern States is still rural and agricultural, and the number of lawyers needed for the conduct of its business is insignificantly small as compared with the number required in the commercial and manufacturing States of the North. In New York alone there are almost as many lawyers as in all the 14 Southern States. Nor have we any reason to think that the percentage of well-trained lawyers in the Southern States is materially smaller than in New York, for instance. In 1905 there were 14,614 students in all the law schools of the United States, of whom 1471, or about 10 per cent, were in the Southern law schools. An inspection of the catalogues of four leading Northern law schools for the same year shows that 160 young men from the South were registered in them. It is safe to conclude that at least 200 Southern students are being educated in the best Northern law schools members of the Association of American Law Schools. Add to these the 350 who are registered in the three Southern schools which enforce the requirements of the Association and we have a total of 550 of the 1671 Southern law students, or 33 per cent, who are supposedly receiving the best training to be had, while 1121 are being trained in inferior schools. In New York, in 1905, of 2768 law students there were registered in schools now enforcing the requirements of the Association of American Law Schools 734, or 26 per cent, who received the best training, while 2034 were receiving inferior training. That is to say, in New York State alone there were nearly twice as many men being inadequately educated for the duties and responsibilities of the profession as in the entire South. Nor, upon a candid survey of the whole question, can we conclude that the young men in the inferior New York schools have any advantage over the young men in the inferior Southern schools, save in the one respect of a better average preliminary education. On the other hand the record of Texas is quite the cleanest in the Union, in this respect. Not a single law student is being trained in that State who is not held up strictly to all the requirements of the best law schools, as fixed by the Association of American Law Schools, while in North Carolina every student is preparing himself for his profession in a three-year day school.

But the educational delinquencies of New York, or of any other State, afford no excuse for the backwardness of the Southern States in matters pertaining to legal education and admission to the bar—and that they are sadly backward has already been made apparent. All men of public spirit and broad sympathies, but especially those of us who know and love the South as our ancestral home, long to see this reproach removed, and, therefore, we seek earnestly for the needed means. Certainly, however, such means will never be found until the actual causes of the condition complained of are understood.

Let us look for a moment at the conditions of Southern life as they actually are. Not driven to the struggle with a rigorous climate and a reluctant soil which compelled the settlers of the North Country to congregate in villages and towns for the sake of mutual aid and protection, the Southern settlers established homesteads remote from one another, and, this tendency being further aided by the unfortunate institution of domestic slavery, the unit of Southern civilization became the essentially independent patriarchal plantation rather than the township or village community. The Southern civilization was almost exclusively rural, not urban; and despite the results of the war, and the great industrial progress of the last two decades, the urban element in the South still remains relatively very small. Thus the census of 1900 showed that only 15 per cent of the total population of the Southern States lived in towns and cities containing as many as 2500 people, while only about four per cent lived in cities of 100,000 or more. The corresponding percentages for the whole country were 59.8 per cent and 18.7 per cent while in New York 73 per cent of the population was urban, 60 per cent living in cities having 100,000 inhabitants or more.

The village school of the New England settlement, which soon developed into the graded common school and high school under continuous management, capable of giving certificates and diplomas, properly sealed and tied with a blue ribbon, was impossible in the South. The prosperous planter would have a governess and tutor, and the poorer children in the country got only such schooling as accident brought them. Frequently in the country communities subscription academies were established for the older boys, usually taught by young college graduates, pausing for a year or two for financial recuperation before taking light into one of the learned professions. These schools were often well taught and not a few of our most distinguished scholars owe their awakening and inspiration to some such evanescent academy " down South," but their courses were not continuous, shifting haplessly with rapid changes of teachers, and often discontinued altogether on account of a temporary decrease in the number of pupils in the community. Hence the preliminary education of the Southern youths, while often excellent in fact, was very defective in form and not well-rounded, and seldom bore such fruit as diplomas and blue ribbons. As the young men of the South seldom could obtain any regular preliminary education, the colleges and universities could not require any. If during his four years at college the Southern student learned a reasonable amount of Latin and Greek, a little mathematics, and a great deal of logic and history, and orated before the literary societies, he was graduated without considering whether he had read *Aurora Leigh* or *Enoch Arden* before he was admitted. And, curiously enough, it turned out that in many cases he was excellently well educated. For the same reason no one thought of requiring a high school certificate of the candidate for admission to the bar, or indeed any special legal training. The only question seriously considered was: Is he bright enough to be a lawyer, and can he speak well enough to "plead" causes? The shyster and the ambulance chaser were not much to be feared, for the profession was not then rich in anything but honor, and the lawyer who was not honored had little to keep him at the bar.

Much of the Old South has passed away, but the old system and the old habits of thought have left a deep impression that still endures. The population of the South is still largely rural; its common school system is yet undeveloped, and there are still large areas in the South where there are no high schools to which an ambitious farmer's son can turn for a high school course and the talisman certificate. He makes such shift as he can with ephemeral academies or irregular private schools, but seldom completes anything. Is it any wonder, then, that Southern colleges have been slow to close their gates to such a young man, and the legislatures have generally declined to bar him from the legal profession?

Despite the much vaunted progress in the South, the greater part of the people are still distressingly poor as compared with similar communities in the North. It is true that fortunes are now being made in manufactures, but there are no accumulated fortunes that endow colleges, or largely aid public enterprises. As a general rule the men who are making money rapidly are engrossed in that occupation, and take no thought of education of any kind save when the school laws interfere with the employment of profitable child labor. The dividends either go Northward or promptly into other and larger cotton mills, so that the general educational conditions is not so much improved as the prosperous census returns would lead us to expect. Save in a few larger cities, the practice of law is far from lucrative, and there is little pressure to gain admission to the ranks of the profession. Able and ambitious young men are turning rather to business pursuits. As the commercial and manufacturing interests of the South increase in relative importance, and its population becomes more largely urban, the services of the lawyer will become more necessary, and more liberally compensated. The number of those seeking admission to the bar will greatly increase, and the placing of proper restrictions upon such admission will become a problem as serious as it now is in the commercial States of the North. At present, however, the disputes and business transactions incident to the life of an agricultural people do not often require in their settlement a very high degree of skill in the law, and the rewards of such primitive professional services offer little inducement to the highly trained lawyer.

Hence we perceive that the backwardness of the South in respect to legal education and admission to the bar is not due to indifference or to any peculiar depravity, but to the natural result of the working of economic conditions. Therefore, we do not condemn the actors, but rather regret the conditions under which they act, and commend highly those who have risen superior to their economic environment.

But there is one other phase of this subject which we must consider briefly in closing. The weaker law schools in the South—and they are many—which are dependent upon their daily revenue for their daily bread, cannot in the nature of things rise above local economic conditions. But to the strong institutions of the South, like the law schools of the State Universities, and of Washington and Lee, Tulane and Vanderbilt, to which temporarily failing patronage would be of little moment, we would commend the duty and privilege of the right law school to lead and not to follow, to direct the current of public opinion and not to float aimlessly upon it. The best is none too good, and in the upbuilding of the New South, she has need of well trained lawyers. Ill-trained ones are quite too expensive for a progressive people. Three years are few enough to give to the huge task of training the student in even the fundamental principles of our complex jurisprudence and to a right view of his professional duty, and the admitted hardship of requiring an adequate preliminary education will diminish rapidly with the growth and development of the public school system, now so happily arousing the interest and aid of all public spirited Southerners, and will even under present conditions, in all cases yield to the proper determination of the young law student to start aright. The example of the Law School of the University of Texas is noble and inspiring. Despite the fact that the requirements for admission to the bar in Texas do not include any considerable preliminary education, or any fixed term of legal study, that institution has resolutely required of its law students a sound high school education before entering and three years of thorough work before graduation. After the next session it will go even further in its work of upbuilding the Texas bar, and will require for admission one year of work in college. We are glad to see that although the two famous Virginia schools which have always numbered so many Texans among their students, have refused to advance their standards or requirements, the Texas law school has flourished even more than the green-bay tree, and is now easily the largest and strongest law school in the South. The history of the North Carolina Law Schools is scarcely less glorious, and those of us who look to the Old Dominion as our home cannot but bow our heads in sorrow that the law schools of the University of Virginia and Washington and Lee, with their long and honorable careers, their high ideals and thorough work, their relatively great strength in resources and in distinguished and loyal alumni scattered thickly throughout the South, should have permitted Texas and Carolina to wrest from them a leadership that was historically their own, and presented to the rest of the country the distressing sight of Virginia a laggard among her sisters. In justice it should be said that the tardiness of these schools to make answer to the spirit of the time is not chargeable to their faculties, but to those "higher up," who have not yet seen the light. May they soon come to appreciate the real legal significance of the beautiful legend carved upon the facade of the great auditorium building overlooking the quadrangle at the University of Virginia, "Ye shall know the truth, and the truth shall make you free."

THE RELATION OF INDUSTRIAL COMBINATIONS TO EXPORT TRADE.

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The manufacturer in his efforts to develop an export trade finds problems and difficulties that did not confront him when he sought wider markets at home. The longer time that intervenes between the soliciting of an order and its filling has unlimited possibilities for fluctuations in prices of material, wages and transportation and the delays in settlement lock up capital that might be utilized several times over if the consumer had been nearer the producer. Laws affecting import duties may be changed in the interim, contracts to purchase may be broken with the annoying difficulties that meet a foreigner in attempting to secure enforcement by legal processes, and strikes that could not be anticipated months in advance might embarrass the manufacturer or cause him to meet his obligation at a sacrifice.

Still the advantages of an export trade to the producer, to the country and to the home consumer are so great that the dangers and difficulties just enumerated should be valiantly met by the manufacturer who, in return for the benefits he bestows, ought to have the aid of his government and the encouragement of his fellow citizens.

The good features of foreign trade are so manifestly axiomatic that their enumeration carries with it their demonstration. First and foremost is the widening of the circle of exchange, making the money involved purchase, before it completes its cycle, a larger variety of articles to meet the needs of a greater number of persons; then we have the bringing into the country in return for the goods sold abroad large sums that pay for domestic materials and wages which in their ramifications benefit countless multitudes; and finally there is the greater elasticity of production that an export trade makes possible. It is under this last category that we find some of the unappreciated benefits that come to those who buy from world purveyors.

By elasticity is meant the wider range made possible for the productive agencies so that the domestic demands in response to unexpected causes would not likely feel restricted. The concern that has created a foreign market can manufacture up to the predicted consumption at home and abroad and in the event of greater demands from neighboring consumers there is the chance of meeting them by allowing a part of the foreign business to fall into the hands of near-by producers. Better still, such a concern is not held down to so close a margin above anticipated orders knowing that the surplus can find sales across the seas. Then, too, great establishments can risk production on a scale that means maximum efficiency, confident that in case of tighter markets at home, they can sell their output abroad at prices low enough to catch the business without thereby fixing rates that could not be indefinitely maintained. From this greater efficiency the home consumer derives a permanent advantage, the foreign buyer an occasional gain, the factory avoids the loss incident to shutting down for a season and laborers are given continuous employment. In the possible disposition of surplus even at a small profit, or at cost, rather than its consignment to the almost valueless scrap, we have risks and profits so distributed as to give to the domestic buyer advantages that he could not enjoy if he dealt with a concern having a more contracted patronage.

Of course, a part of the benefits here mentioned are not exclusively inherent in establishments blessed with an export trade—they are equally present in concerns whose trade is wholly domestic. But it must be recognized as true that the industries which have assumed proportions great enough to insure the advantages named, have achieved these proportions in a great measure because of the widening circle of trade. However, a greater agency in extending these advantages is the possibility of disposing abroad of stock that becomes surplus because of changes in style, methods of operation, or results sought that made themselves felt locally before they could affect tastes or wants in distant lands. This might be conversely true. That is, the surplus of manufactures made for foreign consumption might, after the demand was met, be just the thing to satisfy a local want. To illustrate: Suppose there is a maker of harvesting implements whose resources of manufacture and distribution make it possible for him to send his machines into a narrow belt along which wheat ripens and must be cut within a fortnight. His output must be limited and with even the maximum permissible ratio of surplus to predicted demands, there is a very narrow margin for demands made extra by a heavier harvest and if this extra stock is consumed the added profits are insufficient to give a single purchaser an appreciable advantage. In contrast to this condition, let us think of a maker whose resources make it possible to cover the district from Central America to Canada. He has the wants of six weeks or more to meet, and can readily pass the glut of southern markets to fill the demands of northern farmers. Extend this field of activity until every clime is included, and the hungry reaper that finds no wheat upon the equator can go northward or southward following the sun as it ripens the wheat and every month furnishes needy buyers. The improvements suggested by the experience n the earlier harvest are placed in the latter sales, and the end of this ate season is so near the beginning of a new season in another zone hat the latter profits by the lessons learned in the former. And so, in cyclic measure the leaves of the book of experience are turned and each is its predecessor's debtor. Simply change the article to be marketed and modify slightly the causes for varying demands and a fair picture will be presented of the advantages that accrue to each purchaser when the stall from which he buys is in the world's market.

For many years the energies of our people were expended in administering to the wants of one another and our rapidly growing population absorbed the output of shop and factory. Money came from abroad to seek investment and in staying here it became the purchasing power to meet wants which our prosperity engendered. High standards of living resulted from the ease with which desires were gratified and the wages paid made it possible to meet the standard set. But it was not possible to beget wealth by trading with one another, and the interest due abroad for investments made here must be paid.

It is not possible, nor is it necessary to our purpose if possible, to point with definiteness to the causes that brought about a realization of the need to increase our foreign trade, but a study of statistics will show that the results of the awakening came within the decade 1890-1900 when our total exports of manufactured articles increased from 204 millions to 606 millions, or per capita from $32 to $80, while our imports of merchandise of all sorts within the period named increased by only 60 millions with a decrease of $1.47 per capita annually.

It was in this decade that the strong plea was made for reciprocity—the word appearing in political platforms for the first time in the enunciation of Republican principles by the convention of 1892. It is true, the reciprocal arrangements were thought of primarily in connection with our intercourse with the countries of South America, but the benefits of such trade relations were specifically stated as tending to materially increase our sales abroad. In this platform are found the words: "We point to the success of the Republican policy of reciprocity, under which our export trade has vastly increased and new and enlarged markets have been opened for the products of our farms and workshops . . . and claim that, executed by a Republican administration, our present laws will eventually give us control of the trade of the world."

In the Democratic convention of the same year it was deemed wise to endorse the principle of reciprocity but to take from the opposing party any credit that might come for its inception and introduction.

The Republican convention of 1896 met the criticism that reciprocity juggled with the people's desire for enlarged foreign markets and freer exchanges by pretending to establish closer trade relations for a country whose articles of export are almost exclusively agricultural products with other countries that are also agricultural, while erecting a custom house barrier of prohibitive tariff taxes against the richest countries of the world that stand ready to take our entire surplus of products, and to exchange therefor commodities which are necessaries and comforts of life among our own people. The platform adopted declared that "protection and reciprocity are twin measures of Republican policy and go hand in hand—protection for what we produce; free admission for the necessities of life which we do not produce; reciprocity agreements of mutual interests which gain open markets for us in return for our open markets to others. Protection builds up domestic industry and trade and secures our own market for ourselves; reciprocity builds up foreign trade and finds an outlet for our surplus." In 1904 the extension of our export trade was emphasized as the end sought, with reciprocity as a means thereto.

This brief extract from political history is cited simply to show that conventions, seeking to reflect public opinion rather than create it, saw the extension that should be given to our trade, gave their endorsement and sought to claim some credit by pointing to legislation which within the period of our great commercial activity had been enacted.

Economists would suggest other causes for the rapid development of our foreign trade and people arguing for or against industrial combinations will point to this extension as a confirmation of their contention.

Whatever may have been the agency that called this trade into existence, diverse as may have been the instrumentalities that have promoted it, so far as the future is concerned they are valueless unless they can suggest means for its further growth or at least check influences which threaten its retardation.

While there has been some fluctuation in our *total* exports, there has been a steady growth with an increasing ratio of gain in our export of manufactures from seven millions in 1820 to 686 millions in 1906. Our ability to sell food stuffs depends upon conditions over which the producer has no control and with the growing demands at home, the surplus available for sale abroad must diminish unless more intensive farming is practised. This becomes especially apparent when we find that while our population between 1890 and 1900 increased by 13,681,000, there were added within the same decade only 1,816,000 to the army of farm laborers of all classes. During the past year, 1,245,000 immigrants came to our shores, who, knowing but little of our agricultural methods and landing remote from our farming districts, have become consumers of food rather than producers. In 1906 our production of wheat exceeded our consumption by 97 million bushels while in 1900 this excess under crop conditions quite similar, was 186 million bushels. This great difference can be understood when we find that the per capita consumption between the dates named grew from 4.74 bushels to 7.08 bushels. In the case of corn the excess of production over consumption between 1900 and 1906 has suffered a loss of 74 million bushels. To correct the impression that larger quantities of grain are year by year converted into meat and sold abroad as food products, only a glance is needed at the statistics of exports of all forms of meat and dairy products. They show that in 1900 we sold abroad products of this sort to the value of 184 millions dollars while our sales for 1906 amounted to only 169 millions.

This analysis must clearly show that our commercial prosperity can best be advanced by stimulating our manufactures, increase the number of our factory hands and artisans and feed to them our present surplus of food products. In this way we send abroad the raw materials of mine and forest, worked into shape under the direction of American ingenuity and fashioned by men nourished by the products of our boundless farms.

Out of a total export during 1906 of 686 millions of manufactured goods 608 millions came from establishments that might be characterized as trusts or industrial combinations. The relation, therefore, between concerns of this sort and our export trade is worthy of most careful attention. A very important feature that must be considered is the question of labor. Taking the most recent data available and assuming that concerns which engage in foreign trade employ in meeting that trade a number of workmen which bears to the total number employed what their foreign business does to their total output, we find that 216,000 persons are engaged in producing articles for consumption abroad. If each wage earner supports three individuals—which is regarded as a fair estimate—three-quarters of a million people in this country are directly dependent for a living upon our export trade. To this number should be added 7890 officers and salaried men whose services are similarly engaged. Each of these, as a rule, is the head of a household supporting that number of homes with their greater wants that must be met.

It is impossible to determine with any degree of precision the amount of capital invested in the concerns manufacturing for foreign markets, but the most authentic information places the aggregate between five and seven billions of dollars. The most casual consideration of these stupendous figures suggests that nothing hasty or ill-advised should be done that would jeopardize a trade which means so much to the nation as a bringer-in of money from abroad, which supports such a large army of workmen who are consumers of our farm products, which utilizes in the most profitable manner our wealth of raw materials, and upon whose profits so many stockholders scattered over the land rely for dividends.

This seems an opportune time for uttering a word of warning to stay the lynching spirit that animates legislatures to condemn corporations without indictment and suppress them by indictments instead of trial, when States Attorneys levy a species of blackmail by compromising claims for three millions with $200, when juries are exercising the right to define trusts, monopolies, and restraint of trade and fixing the fine with the exigency of the public treasury in mind.

There are men who failed to see opportunities or let them slip without seizing and now looking upon others' success bewail their failures and appeal for aid under the guise of clamoring for the protection of their fellows. They seek to stop evolution by revolution and ask Congress to stay progress by hasty and illy advised legislation.

To declare a corporation a trust is evidence of keen acumen; to denounce it as a monopoly shows deep concern for the productive agencies without the pale; and to file an indictment for restraint of trade is proof positive of an unselfish interest in the welfare of consumers. In the legislature of nearly every State in the union there are men who fully realize the value in prestige and votes of legislation aimed against the few who are successful under the specious plea that they are responsible in some mysterious way for the incompetency of others, and so, to win praise for watchfulness and fearlessness, they ntroduce measures against restraint of trade which as laws become the efficient means for restricting commerce, and acting as artificial checks force the foremost in the industrial race to wait for the hindmost to catch up, and enclose trade within narrow walls.

When the world is the market the business must be on equal magnitude. Co-operation of many men and the aggregation of their many small capitals are necessary to erect factories, to organize labor and secure the best results by opening markets for the exchange of manufactured products among all peoples. Still the field is open to all comers. New manufactories may be drawn into the association, but no monopoly is created for new ones spring up to take their places. Combinations controlling millions of dollars, with the world for a market, do not have a tithe of the influence in controlling that market hat the formation of a partnership by two grocers has in the market of a country town. If we are to extend our foreign trade or even have it keep pace with our growing purchases from other lands there must be a keener appreciation of the fact that the magnitude of indusrial association must correspond with the magnitude of the business lone, that business cannot be kept within the artificial boundaries of countries and States, and that it is sheer madness to attempt to restrict business as that of a local manufactory may be restricted.

Past experience has revealed some of the abuses resulting from aggregations of capital. There have been many instances where monopolies exercised mercilessly powers granted to them. They were in practically all cases monopolies because of exclusive rights granted to them by he government and made secure by force when necessary. Without such a grant or a basic patent under the government's seal, no association of men, no aggregation of capital can succeed in monopolizing trade for more than a brief period of time. Thorold Rogers in speaking of the reasons for the failure of the Dutch Indies Company says: "They kept up prices, and so limited consumption. They strained every nerve, exhausted their credit in their effort to keep by main force other traders out of the field, experience proving that the only way one can check competition is by lowering prices. In the expectation of getting one large profit on each transaction they succeeded in making a small profit or even loss on their transactions put together, for it costs more to protect a designedly narrow trade than it would to establish and render permanent an intentionally wide one. In brief, they narrowed their market and so narrowed their profit."

Every business association of the present day formed for any other purpose than to avail itself of the economic benefits of association, by means of which it may be enabled to lower prices and to extend its market has experienced, or will experience, the truth of the words just quoted.

The converse of this general proposition, mentioned once before, is equally true—the increase in production cheapens the cost to the consumer. It has been aptly said: "Wheat raised in Dakota, milled in Minnesota, carried to Boston and baked in the larger bakeries at a total cost of three and one-half cents per pound. Yet inferior bread baked in the small shops, is sold to the poor at six cents per pound. The cost is nearly doubled after capital has done its part. The cost of railway service does not amount to one-half cent per pound—the cost of retailing is five times that. The railroads carry meat from Kansas to New York for one cent per pound, but the added cost to the consumer after it leaves the railroad is five to ten times the railroad's charge. The country is convulsed by a slight rise in the price of coal, but the poor in our cities who buy coal in small lots pay 100 to 200 per cent above wholesale prices." The economy of the future will be largely in the saving of waste in retailing which averages 20 per cent of the price the consumer pays. Aggregated capital may be used to advantage in this direction.

Small capital, business done on credit and high interest make low wages, inferior workmen and bad work. Just in proportion as industry is rightly organized, the necessary capital invested, and a large trade sought by means of intelligence, economy and small profits, will this condition of affairs be improved. Instead of aggregated capital being responsible for low wages and high prices, it promises the only remedy.

Of the wealth now produced, workingmen receive 90 per cent, so it is claimed, and of the 10 per cent saved and set aside to become capital, workingmen save and own one-half. It is the remaining five per cent in the hands of the few which makes millionaires and causes so much apparent inequality. The only hope for a better future is in the creation of a greater amount of wealth by means of the improved use of natural forces, more perfect machinery, more effective methods of manufacture and distribution, greater utilization of the present waste of time, labor and material, and in the aggregation of capital necessary for their utilization.

Great concentration of capital resulting from combination of the capital of several concerns is usually called a trust. This term is also applied to a consolidation, combine, pool, or agreement of two or more concerns mutually competing, which establishes a limited monopoly with power to fix prices or rates in any industry or group of industries. If its purpose is to monopolize an industry, fix the price of raw materials, restrict production and enhance the selling price of the product, its existence as a factor in our hold upon foreign trade cannot and would not make amends for its pernicious methods.

The economies that are necessary in order to meet the cheaper labor abroad compel our industries to find locations that are most favorably situated with respect to raw material, power, facilities for distribution and many other elements that figure in the cost of production. A finished product may consist of parts most cheaply made in different localities and assembled in another, and it may happen that the various parts were until recently made by different concerns. Every principle of political economy and factory management would call for a consolidation of these various establishments because of the community of interests involved. If they should all be situated within a single State it would be a simple matter to combine in a joint stock company, but under our federal government an industrial corporation is the creature of the State in which it is organized. If permitted to do business other than commercial in another State, it is only by interstate comity and may be excluded under the provisions of a State law based on antipathy to combinations, the color of the hair of its president, or the grade of cigars he smokes. States are extremely jealous of foreign corporations. In some they are not allowed to hold real-estate. In others they are discriminated against by taxation, the effort having been repeatedly made —sometimes with success—to tax foreign corporations doing business in a State upon the entire capital. This demand to consolidate or to locate constituent elements of production in other States with local stockholders and officers suggested that the stockholders surrender their stock certificates into the hands of trustees and take from them certificates showing the amount of interest thus surrendered. This method, first adopted about 30 years ago, called into use the term trust. If every share of stock in the constituent companies represented actual value and if all shares were surrendered in return for certificates calling for the exact amount surrendered the vicious attempts to control with comparatively few shares a number of concerns by holding a majority of shares of the trust would not have aroused such antagonism as to induce the half dozen trusts that came into existence to voluntarily dissolve and be converted into large corporations. The war against trusts becomes a war against corporations, though in the public mind the former term will survive.

If it be admitted that business of a magnitude to overleap State boundaries and be commensurate with the nation is to be tolerated in the United States, then the industrial combination must also be tolerated, or the law must legalize some device to take its place.

When the rights of States were granted to us in our Constitution, there was no dream of the present ramifications of commerce. Steam and electricity in their economic utilization must regard the boundaries of States as artificial as those which delimit a town or county. New Orleans and Seattle are as near to Chicago as were Danville and Peoria a half-a-century ago and Federal license would be just as appropriate to-day as was a city charter when our industries were in their beginnings.

There is nothing inherently evil in trusts; like all other business combinations, whether partnerships, associations, or corporations, they are evil if organized and conducted for evil purposes, and beneficial if organized and conducted for legitimate ends. Increased concentration of capital and commercial power finds its justification and warranty for existence in giving to the community better service either in superior quality or inferior price of its product. Every attempt to ignore this principle has met with disaster and each effort to exploit the community through higher prices intead of exploiting nature through improved methods of production, administration and distribution will spell ruin.

It is the community made up of capitalist and laborer that creates the wide demand, furnishing the greater consumption which is the market that makes aggregations of capital profitable. A disregard of the obligations to the community in the attempt to lessen, because of the greater resources, the expense of production and at the same time put up the price of the product through a control of the market, is responsible for the ill-repute into which some of the combinations have fallen and the suspicion under which the others rest.

There is at hand an efficacious means for putting an end to this economic rapine. It needs no legislation to call it into existence nor new machinery to make it effective. It lies in the extension of the functions of our very excellent Census Bureau, coupled with the Bureau of Statistics, Bureau of Corporations and Bureau of Manufactures, by which the American people as consumers and potential producers can be informed as to the price of materials, cost of production and selling prices demanded. If the difference between costs and prices assume, in the minds of those who know, undue proportions, two results will inevitably follow: A curtailing of consumption, and the inducing of idle capital to embark upon a business that seems so promising.

Real, active competition does not have half the terror that probable, potential competition has. Money is now abundant, ordinary securities pay low rates, and capital tempted by our prosperity is ready for industrial ventures. However greedy a concern might be, self-preservation would be motive enough to induce it to keep the price by the introduction of every possible improvement and economy so steadily on the downward move that competitors would refrain from the attempt to undermine.

There is no fallacy so widespread and so provocative of nagging legislation as the idea that industrial combinations seek through monopolistic control to fix costs and prices beneficial to themselves while harmful to the community. No one knows better nor appreciates more keenly than do the managers of great industries that safety rests in small margins and profits must come from large sales.

Paternalistic legislation is hurtful if it keeps in existence competition, that is expensive because inefficient. It is reactionary if it, in suppressing large corporations, reverses our policy of industrial freedom and in demanding individual producers in lieu of corporate concerns it throws us back to the time of the hand loom, sickle and push-cart.

Resolve the railroad corporations into their integral concerns and we find ourselves in the midst of conditions that prevailed 30 years ago. Prohibit co-operative industries and we will see the farmer journey from wood-worker to black-smith shop and then to the painter to have made a plow which he can now buy with the time these journeys would cost. Restrict production to single lines and we would find in scrap-heaps waste materials that now meet the cost of production.

In our country's youth surplus capital was not available for the creation of great enterprises and foreign money was slow to come so far for investment in precarious industries, so man associated himself with man, joined his small means to that of others and in co-operation achieved results which, in older countries, might have rewarded individual efforts. Small concerns thus created paid the penalty of their success in seeing rivals come into the field who, conscious of local conditions only, produced when demands were great, and heartlessly discharged their workmen when markets were glutted. In the absence of widening markets profits were sought in cutting prices with the accompanying result of failures and uncertain adjustments of supplies to demands. Stability required larger organization and so small concerns merged into greater establishments and more men became interested in their management. They were democratic organizations suited to our democratic instincts. In the natural economic development, greater concentration of capital was needed to make possible a more minute differentiation of talent and a higher integration of industrial energy, until now we have a precision that means accurate relation of supply to demand; organized employers treating with organized labor insuring permanency in production; and elaborated means of distribution reaching the uttermost parts of the earth and making the world our market.

The giant who is only a bully merits our contempt, and the great corporation that abuses its opportunities to benefit the community deserves our condemnation. Twenty centuries have placed an ever strengthening seal of approval upon the injunction: "By their fruits ye shall know them." The least attractive blossom may give way to the most luscious fruit. Fire can burn and water drown, but rightly conjoined they form the living breath of the world's activities. Dynamite can wreck a home and kill the innocent, but it can likewise loosen the sculptor's marble or break down the miner's coal. Religion has been made a cloak for vice, faith has at times degenerated into bigotry, and charity sometimes promotes pauperism, but no one proposes that we dispense with religion, faith, or charity.

There are dangers in concentrated capital and evils in industrial combinations, but the problem should be to eradicate all that is bad and curb everything that is threatening. The wounded soldier was killed before surgery came to amputate a lacerated limb and give to its owner life and usefulness.

The cobbler working at his bench must await his customer and to-day's patch differs not a whit from yesterday's; the individual workman with his one apprentice can know at most the needs of his neighborhood but his conception of style and quality is no larger than his sphere of activity; the employer of a score of workmen may become acquainted with the wants of his town and in his leisure hours ascertain enough regarding the prices asked by his competitor to impel closer attention to economies in order to meet them; the head of a large concern sends his representatives throughout his state, and in seeking wider markets, new materials may be found or better styles and methods of manufacture discovered.

As productive methods become more and more specialized, expert management is more and more demanded and the purchaser of the smallest fraction of the output reaps the benefits of this superior skill. When the market is world-wide, we have the highest example of business acumen, for nothing less could search out unsuspected buyers; we have the most conservative management, for recklessness would be fatal when months intervene between orders and settlement; we have the closest study of economies of production for loss of trade has sharpened the wit of every competitor; and we have through the greater elasticity of foreign trade a more sure response to every demand.

The capital has grown from the dollar or two needed to buy the cobbler's awl and hammer to the millions required to engage the world's trade. These millions are giving us cheaper goods; they are widening our knowledge and broadening our sympathies; they are knitting peoples together through common wants; they are steadying economic conditions and deferring panics; they vouchsafe to labor remunerative employment; they take materials to waiting factories, transmute them into acceptable forms and set them down in every quarter of the globe where lips have framed a heart's desire.

In return for this, these millions deserve just returns, and as long as they ask that alone, it will surely come. And we, the beneficiaries of all that results from this last stage in the economic development of our country, ask a cessation of the activities of those demagogues who, seeking to emulate others, ignorantly and evilly assail concentrated capital in periods of popular prejudice by grotesque legislation and hamper its usefulness by uneconomic laws.*

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*Read before the National Conference on Trusts, Chicago, October 25, 1907. To this Conference the author was a delegate from the District of Columbia.

THE KANTIAN BASIS OF AGNOSTICISM.*

BY J. MACBRIDE STERRETT, A.M., D.D.,
Professor of Philosophy.

Agnosticism is nothing new in the history of human speculation. For centuries it paraded under the name of scepticism, until in 1869 Huxley christened or rather paganed it as agnosticism. We might question the propriety of his borrowing the etymology[1] from St. Paul's speech on Mars Hill, when he found the Athenians worshipping before an altar to *The Unknown God.* They were worshipping a real god—a being who had made some divine revelation—but they were only ignorant as to just which one of the gods it was—Zeus, Apollo or Minerva. An unknowable God is not worshipful. The Athenians had no thought that the unknown God was unknowable. In fact they worshipped, because they believed that some one of the gods—just which one of them being unknown—had performed some divine act on the spot where they reared the altar. So far the god was known to them. Doubtless they expected to learn which one of the gods it was who had done the deed and then they would put his name in place of *The Unknown God,* on the superscription. And this was what St. Paul proposed to do—to give them knowledge of the unknown but not unknowable God whom they worshipped.

Agnostics worship nothing. For the unknowable means the non-existent for human beings. The modern term agnosticism, however, is differentiated from the scepticism of earlier schools of philosophy, by its application of the term to God. It signifies the inability of the organ of knowledge to know God, because it asserts that man can only know the finite and sensuous. Scepticism is the broader term, as it has often maintained that man cannot really know anything, sensuous or otherwise, not even that he knows that he cannot know.

Modern philosophical agnosticism—man cannot know the Absolute or God—is generally accompanied by the most dogmatic and uncritical sort of gnosticism as to the finite and sensuous. Gnosis is merely another term for science—Greek (γνῶσις) instead of Latin (scientia).

Modern science is dogmatically gnostic. The foundation for modern theological agnosticism and scientific gnosticism was laid in Kant's *Critique of The Pure Reason* in 1781.

Hume had analyzed all knowledge—scientific as well as theological, and proclaimed the impossibility or the invalidity of all forms of

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*This paper is printed in the form in which it was delivered to a class in the course on *The Philosophy of Religion.* It forms a part of the Epistemological Section, where the critical bases of Agnosticism and Gnosticism are examined, preparatory to a critical evaluation of religious and heological knowledge.

[1] Huxley's Col. Essays, V. 239.

knowledge except that of *unrelated sensations.* All the relating tissues between one sense impression and another—that of cause and effect in particular—were held to be but figments of the mind. Thus he left even the sense-world in a senseless chaos, because of the inability of the mind to know relations. Thus the foundations of modern physical science as well as those of theology were invalidated. This absolute agnosticism gave an unthinkable, unknowable world. This was uncomfortable, unendurable to man as a thinking, knowing being. It woke Kant up and set him about making a new analysis of the organ of knowledge. Hume was an absolute empiricist—the *consistent* empiricist and agnostic.[2] A consistent sensationalist must be speechless or utter but a series of disconnected sounds parallel with a series of unrelated sensations.

But man is not thus speechless because he is not a sensationalist. He has at least some knowledge—that of mathematics and that of physics. Can it be that this knowledge is invalid? Kant said let us analyze experience anew. Let us see the constituents of this knowledge—whether it can be resolved into agglomerations of sensations and the work of the imagination.

What is knowledge—at least that which we call physical science? What are the conditions that make it possible? We note only the result of it as bearing on the capacity of man to know the Absolute or God.

Granting that in his analysis of knowledge he threw the emphasis off of the sensational element and showed that the far larger contribution was made by the constitution of the mind, he still limited the field of knowledge to the data of sensation. He held it to be impossible for knowledge to extend to sense-transcendent subject-matter, or to this sensuous subject-matter as knowable by higher forms or categories. Thus it was impossible to know God and impossible to know the knowing self. Only the empirical *ego* could be known. And God could only be known if He were an empirical sensuous object.

We may well grant the very great and important place of Kant in the development of philosophy. But we may controvert the whole of his first *Critique,* beginning with his false conception of knowledge.

What is the nature of knowledge? Its fundamental essence is that it is an apprehension of reality. Here the empiricists are right in making sensuous data *real* and not mere appearances, i. e., if they confine knowledge to them. And this is the point which Kant attacked, in order to controvert their mere sensationalism. But he thus took the position that knowledge is never knowledge of realities, of things in themselves, but only of phenomena, of appearances. But then Kant held beyond and against sensationalists that knowledge of these phenom-

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[2] Cf. at length my paper on Locke, Berkely & Hume, The George Washington University Bulletin, December, 1904, pp. 1–26.

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ceived as by a waxen tablet. This given is not exactly our sensations. For in sensation mind is active and transforms what it receives. Thus Kant does not say that our sensations—the *matter* of our knowledge, is *given* to us *a posteriori*. What he says is that the matter (or stuff) of our *sensations* is given. Our sensations are not given. They are ours by active construction. Still back of them, for Kant, lies something unknown which mind makes into sensations. He calls it *the matter of our sensations*, not matter as we know it in space, for that is a mind-constructed matter, but matter as some inscrutable ground, source or cause of the mind forming its sensations. This he calls the *Ding an sich*, that never enters into experience or into our known world. As opposed to empiricism the whole of our experience is subjective, mind-included. Even the raw stuff of this world is not

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echanical copying process. The whole of the emphasis is placed upon the active synthetic processes of the mind—active in sensation as well as in understanding. This he shows in his *Aesthetic* and *Analytic.* We are not here concerned to make any detailed analysis of his doctrine. We only note the emphasis placed upon the knower—the efficient presence of mind in the whole realm of experience. The knower is not in space and time, is not an object or a relation between objects. But space and time and all relations between mind-constituted objects are in mind. It is true that our bodies and our empirical egos are also mere phenomena for the knower. That is, we must carefully distinguish Kant's doctrine from that of empirical idealism. This is difficult to do, and something that Kant himself often failed to do. Perhaps it would be better to substitute the term ***knowledge*** for that of the knower. For "the transcendental ego of apperception"—the source of the categories, the activity of knowing is never an empirical, subjective individual, but rather a transcendent logical presupposition—like the unknown ***Ding an sich*** at the basis of sensation. Each of these is, for Kant, an unknown and unknowable X—but also a necessary presupposition of knowledge.

The ***Ding an sich***—the noumenon, the absolute, the real reality at each end of knowledge is not only unknown but unknowable. This is Kant's explicit form of agnosticism. But to reach this let us begin again and state Kant's fundamental problem and its solution. His fundamental problem was that of knowledge—that is, the question of epistemology, of the origin, nature, validity and limits of knowledge.

What are the conditions of the ***possibility*** of knowledge, or of ordered experience as we know it? That is the problem of his first ***Critique.*** To answer this he makes his analysis of knowledge and ena is not a mere mechanical result of their jostlings and juxtapositions and sequences, but the result of mind, of the active synthesis of universal and necessary forms of thought. We need not hesitate to asknowledge the immense advance thus made by Kant in his vindication of the place of mind in the web of ordered experience. This may be put in one of his own sentences: ". . . *Macht zwar der Verstand die Natur aber er schafft sie nicht.*" That is, it is mind—the active synthetic activity of mind, that gives us our world of *ordered* experience, science, knowledge. It *forms* that world. That world is objective only through this synthesis in universal and necessary forms of thought. Apart from this activity of the mind we should only have the chaos (*Gewühl*) of isolated, subjective sensations. This Hume showed to be the only possible world for the sensationalist. The understanding forms, makes (*macht*) *nature* as an *ordered objective* system. But it does not create (*schafft*) nature. That is, it does not create the stuff, the woof, the raw and heterogenous and disorganized data of sensation. There is something *given*, heterogenous to mind.

Mind is not a mere mirror of an external nature, with no other function than that of accepting a copy of it ready made. It is not a "waxen tablet" upon which the senses engrave ideas, or an "empty chamber" into which they pour them. But it really *makes* this intelligent nature by molding all the raw materials into its own forms. It spaces and times this material. It orders it into definite quantities and binds it into fixed relations of cause and effect, substance and accident. In a word, it *makes* the intelligent *objective* world of nature. That is, it is objective, not in the sense of being external to mind, but as being constituted in universal and necessary forms. Mind can thus know only as it creates. Mind creates the intelligent form of nature, but it does not create the material—the stuff—the woof, the raw disorganized and heterogenous *Gewühl* of sensation. There is something *given* which it does not create, and yet this *given* is not passively received as by a waxen tablet. This given is not exactly our sensations. For in sensation mind is active and transforms what it receives. Thus Kant does not say that our sensations—the *matter* of our knowledge, is *given* to us *a posteriori*. What he says is that the matter (or stuff) of our *sensations* is given. Our sensations are not given. They are ours by active construction. Still back of them, for Kant, lies something unknown which mind makes into sensations. He calls it *the matter of our sensations,* not matter as we know it in space, for that is a mind-constructed matter, but matter as some inscrutable ground, source or cause of the mind forming its sensations. This he calls the *Ding an sich,* that never enters into experience or into our known world. As opposed to empiricism the whole of our experience is subjective, mind-included. Even the raw stuff of this world is not a *given* matter. The *given*—the unknown element can never enter in as it is, but only *as it is received*. It is thus transformed. Sensations are subjective. But they are—as transformations of the *given* element—only phenomena—only appearances. That is, they are our own subjective representations of the unknowable *Ding an sich* that furnishes their *given* element. Our sensations, the raw material, then, are not given us externally, mechanically, *a posteriori*. Our sensations are ours—our constructs of an unknown given element. That is Kant's doctrine. It makes the stuff of the whole of *nature*, of experience to be phenomenal, i. e., our sensations. Within this realm there is no merely *given*—no gross external matter. It is the world as it appears to, as it is made by, mind. It is our known world and yet not the absolute reality, but only phenomenal. This is Kant's doctrine of transcendental idealism or of the ideality of all phenomena. It is most sharply to be distinguished from any form of materialism. So, too, is his doctrine of knowledge to be most sharply distinguished from any sensational or mechanical copying process. The whole of the emphasis is placed upon the active synthetic processes of the mind—active in sensation as well as in understanding. This he shows in his *Aesthetic* and *Analytic*. We are not here concerned to make any detailed analysis of his doctrine. We only note the emphasis placed upon the knower—the efficient presence of mind in the whole realm of experience. The knower is not in space and time, is not an object or a relation between objects. But space and time and all relations between mind-constituted objects are in mind. It is true that our bodies and our empirical egos are also mere phenomena for the knower. That is, we must carefully distinguish Kant's doctrine from that of empirical idealism. This is difficult to do, and something that Kant himself often failed to do. Perhaps it would be better to substitute the term *knowledge* for that of the knower. For "the transcendental ego of apperception"—the source of the categories, the activity of knowing is never an empirical, subjective individual, but rather a transcendent logical presupposition—like the unknown *Ding an sich* at the basis of sensation. Each of these is, for Kant, an unknown and unknowable X—but also a necessary presupposition of knowledge.

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What are the conditions of the *possibility* of knowledge, or of ordered experience as we know it? That is the problem of his first *Critique*. To answer this he makes his analysis of knowledge and tries to show the various *synthetic* conditions it implies—the various constitutive transcendental (not transcendent) relations without which we should not have our known world of experience. The whole of this analysis made dead against the sensationalist account of knowledge —even against that of empirical idealism—the early view of Berkeley, and that of Locke, Hume, Mill, Huxley and Spencer.

The *Aesthetic* is an analysis of the origin and elements of knowledge in *sensation*. For our cognitive faculty has two branches—sensibility (*Sinnlichkeit*) and understanding (*Verstand*).

Sense is an active faculty of mind. The sensuousness of the *Pure Reason* is Kant's starting point. We get the stuff of knowledge in sensation. But sensation, as we have seen, is not a mere mechanical reception of some external reality. Sensations are mind-made stuff—but made from an unknown stuff—a *Ding an sich* wholly without the realm of experience and hence forever unknowable.

Our sensations are our own—not some external things. For there can be no external things to mind in knowing. Even the *Ding an sich* is not external—something in space outside of us. Our sensations are mind made. Then mind *orders* them in space and time which are *a priori* forms of the mind. They are all merely phenomena—things as they appear to thing-making mind, which proceeds to know them by spacing and timing them. Knowing is not in space and time, but on the contrary space and time are the active synthetic conditions, imposed by mind on its sensations. This is the first point to be clearly seen and firmly held as the true Kantian doctrine, i. e., the mind-made character of sensations. With this goes his second point, that sensations are mere *phenomena*—the mind's representations of an unknown *Ding an sich*. Hence knowing is concerned only with phenomena, *never* with reality. It is at least only reality as it is conditioned by the sensuous character of *Pure Reason*.

Absolute reality is non-sensuous. Experience is confined to the sensuous. The non-sensuous is never sensuous and so never comes within the realm of *Pure Reason*. By sense, Kant of course never means merely organs of sense. They, too, are mere mind-made phenomena. But sense is an active branch of *Pure Reason*, which compels everything to be subject to its capacity of receiving, under its own terms, an unknown *given* from a *Ding an sich*. These mind-made sensations are the indeterminate *matter* of phenomena, while time and space are the *forms* of phenomena. The whole subject-matter of knowledge, in the more advanced stage is mind-made and mind-formed and mind-arranged phenomena. But back of the realm of experience—Kant could not say, external to or causal of this world—lies the *Ding an sich*—the unknown and forever unknowable *noumenon* or ultimate reality.

While the *Aesthetic* is relatively the least conspicuous part of Kant's theory of knowledge, it is fundamentally the most important, for it does these two things: 1st. It maintains that an analysis of knowledge shows that sensations are the mind-made and mind-formed stuff of our conceptual knowledge—without which all such knowledge would be the clattering of empty mills with no grist to grind. "Conceptions without perceptions are empty." These, it is true, are mere phenomena, but they are the real stuff and woof of our known world. They are transcendentally ideal, but empirically they are real. This is what Kant affirms at the close of the *Aesthetic,* that his view is transcendental idealism and at the same time empirical realism. It is idealism he says because of "the fundamental nature of sensuous knowledge." "What we meant to assert was this, that all our intuition is nothing but the representation of phenomena; that if we drop our subject or the subjective form of our sensibility, all qualities, all relations of objects in space and time, nay, space and time themselves, would vanish. They cannot, as phenomena, exist by themselves, but only in us."[3] 2d. It is empirical realism because he maintains that these idealities—these phenomena are the only things that we know or can know. This latter point is brought out most clearly as the second part of his transcendental deduction of the categories.

But the *Aesthetic* also gives Kant's fundamental ground for agnosticism. That is, it implicates, in a way inexplicable, an unknown *given* element—a transcendent *Ding an sich.* Of course Kant cannot maintain that this noumenon *exists* or is a *cause,* as existence and cause are categories applicable only to phenomena. Still, consistently or not, Kant does affirm the reality of this transcendent noumenon. In fact his system of knowledge of only phenomena demanded it. But it is something not external to phenomena nor immanent in them. It is at best a limitative conception, necessary to ground his doctrine of phenomenalism.

We need not pause to criticise this doctrine of Kant. We care only to make it sure that he held it. He held to this noumenon as the *given* element in sensation, the substratum of all internal and external phenomena. He also held it to be the real reality underlying our empirically real world of mere phenomena. But when he goes on to maintain its absolute incognoscibility—a something that is predicateless—a mere *thatness* with no *whatness,* he deprives us of any ground whatever for maintaining the reality of the unknown and unknowable *given.* We are not here concerned with the doctrine of the *mundus intelligibilis* and the *causality of freedom* in his *Second Critique,* for that is professedly outside the sphere of knowledge. In fact, in neither his *Second* or *Third Critiques* does he ever transcend the theory of knowledge and its allied and affirmed agnosticism of the first *Critique*—nescient as to *real* reality.

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[3] Max Müller's translation, p. 37.

Let us turn to a brief statement of his doctrine of knowledge in the second part of his first *Critique*—the *Analytic*—an analysis of the conceptual forms or categories or relations implied in all knowledge.

As conceptions without perceptions are empty, so perceptions without conceptions are blind. The active synthic activity of mind is needed to relate into order and system and causal relation the sensation-stuff of experience.

What are the necessary and *a priori* forms of synthesis in a known world? And how are these *a priori* synthetic judgments possible? They are possible (1) because without them we could not have knowledge. They are the necessary conditions of the possibility of experience as a rational system or cosmos. But (2) this necessary character of the categories is itself rendered possible and grounded on what he calls the *transcendental unity of apperception* or self consciousness. The active synthesis of stuff into related, connected, rational experience by the use of the categories is only possible under the supreme condition that the *Ich denke muss alle meine Vorstellungen begleiten können.* That is, there must be a *permanent ego* which remains unchanged throughout the passing flux of experience, both inner and outer or, that of the empirical ego and of the external world. All these phenomena can be synthesized only in relation to a permanent identical self. To state the matter again, synthetic *a priori* judgments are possible, (1) because they are indispensable for the determination or knowing of phenomena. (2) But necessary as they thus are, they are only possible as forms of the synthetic activity of a permanent, identical ego. The "I think" or an identical consciousness must be present in all stages of the synthetic process, if it is to be held together as a whole. There must be a permanent self that experienced something yesterday that is bound casually or otherwise with something experienced to-day, or knowledge would be impossible. That is, knowledge implies a permanent knower as the source of the categories and the consequent relationing of disconnected sensations. He maintains that "the 'I think' is an act of spontaneity that cannot possibly be due to sense" and that these unities, or relations binding many into one, cannot be picked up like particulars in experience. They are furnished by knowing mind.

But here we come upon another phase of his agnosticism. This transcendental ego, or permanent self-consciousness is only a logical or limitative conception, like the *Ding an sich* back of sensations. This transcendental ego, the source of the categories and the necessary presupposition of experience as a connected web of phenomena; this knower that knows is itself unknown and unknowable. This source of the categories can itself be brought under none of its own categories that are essential for knowledge. You cannot put it in space or time; cannot predicate reality or causality of it. This is proven by the second part of his *transcendental deduction of the categories.* That was his proof that these categories, these synthetic unities, are applicable *only* to objects of sensation or phenomena. What alone are synthesized are sensations—into objects in perception and into *related* objects, especially causally and reciprocally related, in the system of experience. That is, the categories are applicable only to that element of experience that comes from sensation. Hence they are not applicable to the *Ding an sich,* the unknown background or *given* element in sensation, nor to the *transcendental ego* or unity of consciousness, at the other end.

Thus Kant's epistemology—the necessary elements in valid knowledge—never gives us a *res completa.* At each end there is an unknowable *given* element that cannot be intelligized, rationalized, known. Knowledge is a continent betwixt two oceans of nescience.

The *given* element in fundamental sensation is unknowable. And the knower is unknowable. For it must be borne in mind that Kant never identifies the transcendental unity of consciousness with that of the empirical ego. The empirical ego is a construct from sensations. Psychology is only internal physics. The passing inner experiences of the empirical ego are synthesized by the same categories and in the same necessary and mechanical way that external phenomena are. Man, as a natural individual, both as to body and mind, belongs to the phenomena of nature and is a part of the sense-world. He is in space and in time. Space and time are not in him as they are in the unknowable knower in sense perception. His passing psychoses are subject to the same categories as are the neuroses of his body. He is not the source of the categories but is subject to them. That is, after all, the knowing subject, the knower, is unknowable. It becomes an impersonal and merely logical unity, devoid of predicates and cognoscibility. In no place does he hint that this transcendental ego is, in some way, immanent in the empirical ego. In no place does he solve the relation between the permanent "I think" and the thinking of the empirical individual. Knowledge thus analyzed becomes a sort of objective impersonal activity, and individual egos are reduced to being mere phenomena among other phenomena that knowing knows, without being known.

We are not now concerned with the advance made by Kant in his second and third *Critiques,* nor with that made by Fichte, Schopenhauer and Hegel. We care only to give his epistemology or theory of the origin, validity and limits of knowledge. He confines knowledge to sensuous data, to phenomena.

We do not care, even to emphasize the fact that his *Critique* really contradicts this. For it is a theory or a *knowing of knowledge,* of the *a priori* organism of knowledge itself, which is not sensuous or phenomenal. The *Critique* aims at giving us a knowledge of the organization or constitution of the *Pure Reason*. It is a knowledge of knowing and not merely a knowledge of phenomena.

We are not concerned even to be sure that Kant was always a believer in the reality of God, in rather a mechanical, deistical way, nor that he held firmly to the immortality of the moral self. We note only that he relegated God and soul out of the realm of *knowledge* into that of *faith* and of the *practical reason,* even though he insisted that these were higher than knowledge. He expressly says the faith is higher and gives the primacy to the *Practical Reason*.

We are here only concerned with the philosophical or rather the epistemological basis which Kant's *First Critique* gave for both scientific gnosticism and theological agnosticism.

Kant vindicates our knowledge of nature—gives the basis for rational physical science. But his validating this knowledge is at the same time an invalidating of the knowledge of real realities—noumena like God and the soul with which metaphysics busies itself. Metaphysics, knowledge of non-sensuous phenomena, is for him at best a *pseudo-science*. This he shows in the third part of his *First Critique*—the *Dialectic*. There he does elaborately what he had already done most concisely and positively in the *Aesthetic* and *Analytic*.

The transcendental ego or the rational soul is not knowable. To attempt to know it leads only to specious paralogisms of reason. The phenomenal soul, the empirical ego is knowable, but must never be confused with the transcendental ego, the permanent unity of consciousness of knowledge. Nor can the cosmos as a completed totality be known. The cosmos as a *res completa* is merely an idea of reason —a limiting and subservient ideal.

Nor can God be known. The proofs of his existence are disproven. He cannot be known because He is not a phenomenon—a piece of the sense world, nor even an immanent constitutive element of that world.

In fact the *Dialectic* is an unnecessary appendage to the *Aesthetic* and *Analytic*. At most it is an application of the theory of knowledge there elaborated to noumena. All knowledge is of sensuous, conditioned, phenomenal subject-matter. Noumena, like God and the soul, are non-sensuous. Hence they are unknowable.

No theist professes that God is only a phenomenon—one among the many and so there is no need of a phenomenological research to find that He is not findable. The whole of the *Dialectic*—at least its positive doctrine of nescience is contained in the earlier parts of the *Critique*.

Eye cannot see—the strongest microscope cannot discover the soul, nor the most powerful telescope find God, unless the soul and God are mental constructs of sensuous data. What need then for the elaborate disproof of rational psychology and rational theology in the *Dialectic?*

What need to go into detailed proof that we cannot know the supersensuous, because it is not sensuously perceptible? But Kant's nescient view goes further. It divorces epistemology from ontology. It maintains that our knowledge is not knowledge of realities but only of phenomena, of appearance in which realities do not even appear or manifest themselves. But a knowledge that is not a knowledge of reality is really nescience. Our knowledge of supersensuous realities is *pseudo*-knowledge. But then, too, our knowledge of sensuous *phenomena* is only real knowledge of *unreal things*. That is the sum and substance of the negative part of Kant's epistemology.

And yet this is not quite all. For Kant attributes to phenomena reality and actuality. These are categories applicable to sensuous data. That is, phenomena are real for knowledge, real and actual in themselves and not as phenomena of noumena, or appearances of real reality. They are the only reals of knowledge, but they are so real, so existent and actual, while noumena are neither real nor existent, that they become the only realities for knowing. Thus in the first *Critique*, noumena are absolutely barred out from experience and allowed, at best, to enjoy as Jacobi wittily said an *otium cum dignitate*. We may merely refer to two other facts, that show how phenomena came to be looked upon as the real and only realities.

The first is, that in his second edition of the *First Critique*, he adds a paragraph on "the refutation of idealism" in which he attributed to external things, bodies, matter, etc., an existence—independent of our thought—thus really making them to be things in themselves. It is needless to say that this added paragraph is in absolute opposition to the fundamental principles of his whole theory.

Schopenhauer thus criticises Kant's "*Refutation of Idealism*": "With the frivolity as well as timidity characteristic of old age, Kant in his latter years actually retracted the views he had formed of the relation of the ideal and the real, which he had embraced in the vigor of his understanding, and which he ever afterward cherished, etc."

The second fact is that the most rigidly literal disciples of Kant—the neo-Kantians—hold that our knowledge must be confined to sensible objects and sensible experience as these are all that we can have. That is, they became absolute empiricists and dismissed the ghost of any *Ding an sich*. They expressly maintained that phenomena are noumena—the only existent *Dinge an sich*.

We believe Kant's "*Refutation of Idealism*" to be un-Kantian. We also believe that neo-Kantianism is not Kantianism. Yet all that can be said is that both of these non-Kantian views are practically, if not logically, bound to follow where more is not made of *noumena* than is made in Kant's *First Critique*.

We plead guilty of not giving the whole Kant—the Kant of the three *Critiques*. But we have given a faithful statement of his epistemology, as giving the reasoned basis of scientific gnosticism and theological agnosticism.

Scientific agnosticism is empirical gnosticism. Neo-Kantianism gives it its philosophical creed. There are no other realities than those of sensuous things and sensuous experience. There is no knowledge of non-sensuous things because there are no such things. *Cultivon notre jardins.*

Theological agnosticism, at the opposite pole, reverts to Kant's unknowableness of noumena, and while maintaining the reality of God, of an externe, transcendent, deistic type, denies the capacity of human knowing to comprehend or even to apprehend him, in the interest of a mechanical sort of revelation.

This has filtered down from Kant's doctrine, through Hamilton and Mansel, on the theological side, and through Ritschlianism and pragmatism on the religious side. The first maintains that reason cannot be the source of the knowledge of God. It holds, in an abstract and untrue form, the truth that all knowledge of God must be revealed by God—that man has no organ for finding a hidden God. The others hold that not reason, but the heart, or the feelings, or man's subjective needs are the organs for the apprehension of the Divine—supplanting *knowledge-judgments* by *worth-judgments* or to use Professor James' expression, by "the cash-value" of any beliefs. In both forms, as in Kant's Deism, we have only an extra-mundane Deity beyond the limits of experience.

In no form of Kantianism is there any conception of the Divine immanence. Things in themselves, noumena, are strictly transcendent of experience. They are not the kernel, the essence of phenomena. Whatever reality he attributed to them was such as had no influence on the course of nature or on human experience as we know it. Necessary as the ground of the possibility of this experience or nature, we can readily dismiss them as absolutely etxra-mundane. "In all practical questions we can treat phenomena as objects in themselves, without troubling ourselves about the original ground of their possibility."[4] That is the standpoint of agnostic neo-Kantianism, which differs but little from Comte's view. Let us confine, they say, our study to phenomena, the only realities there are for us. The course of the world goes and will go on forever all the same, whether or not there are transcendent noumena or non-sensuous realities. They never enter into experience, and experience is all that we have. Let us stick to it, as stick to it we must.

Of course it is possible to controvert neo-Kantianism from Kant's own *Critique*. It is easy to show that the whole Kant, even Kant of only the *First Critique,* maintained the necessity for presupposing the transcendent *thing in itself,* as the super-sensible substratum of our sensibility and of the whole of our knowing reason; the hidden ground of all phenomena and of our knowing them; the true correlate of all our ideas. But we are to treat fully of neo-Kantianism in a future lecture. Here it need only be remarked that either more must be made of this noumenal factor than is done in the *Critique* itself, or it should be banished from the scene. The neo-Kantians do the latter. But Jacobi well remarked that while an entrance of Kant's philosophy into itself is impossible without this factor, "it is equally impossible to abide by the philosophy, if such objects be presupposed."[5] That is to say, that more must be made of the *Thing in itself* and of the *Transcendental Ego of Apperception,* than is done in the *Critique.* And this is what was done in the further development of philosophy by Fichte, Schelling and Hegel. Their systems are critical of the inconsistencies of Kant's *Critique* and at the same time developments of it in a way that neo-Kantianism is not. So for a full criticism of the negative side of Kant and of the inconsistencies of his *First Critique,* we need only turn to these latter systems. This we shall do later on.

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[4] Max Müller's translation, p. 340 and 708.

As subserving our present purpose, we may turn to an examination of the neo-Kantian interpretation of the *Critique,* as this represents its *negative side*—negative, that is, as concerns super-sensuous realities, carrying its agnosticism boldly and frankly to its fullest limit.

Before making this examination of neo-Kantianism we may, however, put in a few words our criticism of Kant's agnostic epistemology. He affirms knowledge, but not knowledge of realities, but only of appearances which are in no way the appearances of realities. He affirms realities—things in themselves, but denies knowledge of them. As we have seen in our chapter on epistemology, the true correlate of every act of knowing is a fact or reality or some grade of it. The act of judgment is essentially an act of affirming reality. The negative judgment only denies something to be real by virtue of its implicit affirmation of some contradicting reality. Thus Kant might, and in places does, as his system requires, deny reality to phenomena by maintaining the reality of noumena. But he no less affirms reality and actuality of these phenomena and positively restricts the application of these categories to aught else than sensuous phenomena and does this by denying *reality* to all non-sensuous Xs.

Our criticism here may be simply with his term ***knowledge.*** He should (1) either increase the extension of the term or decrease its intension. He should extend its grasp over the realm of the non-sensuous which he holds in some other way. Practically, for Kant throughout his life, God and soul were more real than sensuous phenomena. But he denies to faith and the practical and teleological judgments by means of which we are put into relation to them, the character of *knowledge.*

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[5] Jacobi's Werke, 2 Bd., 303.

> "We have *but* faith; we cannot know,
> For knowledge is of things we see."

It is true that Tennyson's "but" badly represents Kant's view, which is that we have faith and the moral sense as something far higher than knowledge. He would put it rather:

> We have *but knowledge.*

We should increase the *extension* of the term knowledge, making it applicable to all forms of human *experience.*

The root of Kant's agnosticism is found in his limiting the term experience to sense phenomena worked up by the categories. That is, as we have seen, in his transcendental deduction of the categories, he not only limits knowledge to these forms but he limits their application to sense-data. "The *ideas of* reason" (God, cosmos and soul) transcend sensuous data. God and the soul cannot be known because there are no sensuous data to which they can be applied. Then by *experience,* in its philosophical sense, he means the total of human knowledge in which sense is worked up by the *a priori* forms of thought. We insist that experience be taken in its wider sense, as the total of human experience—ethical and religious and aesthetical as well as scientific. It is true that Kant in his *Second Critique* does take our moral experience and analyze its presuppositions. Still he resolutely declines to make it a matter of *knowledge.* It is true that he makes it rest upon a faith which he says is higher than knowledge. But after all human intelligence dislikes the invidious distinction. It seeks knowledge, though at bottom all knowledge rests upon faith. But it demands that it have knowledge in spiritual experience as well as in sensuous experience. Knowledge has the primacy for thought, and so declines Kant's restriction to sensuous data. So, too, in his *Third Critique* he shows the necessity for using the teleological judgment, but resolutely denies it to have constitutive function like the causal judgment.

Or as I have said we should decrease its *intension* as used by Kant. That is, we should say that knowing is merely a *subjective activity* applied to sensuous data and thus transform knowledge into an illusion.

But perhaps we can put the criticism in a better form in spite of formal logic's protest. That is, we should do the illogical deed of increasing both the extension and the intension of the term knowledge. We should extend it to cover the whole realm of human experience—sensuous and non-sensuous. But we should also increase its intention, that is, its quality, attribute *meaning*. We should make it to be knowledge of truth and reality, not of mere appearances. This is the positive side of neo-Kantianism. It re-ifies phenomena. While restricting its extension to them, it makes them *real*, giving its epistemology its true correlate of ontology. But we must not follow it in thus restricting its extension. Sensuous data are real, but God and the soul are also real. But are they alike real? Or are these all separate realms of experience and is our knowledge merely compartmental? Are God and the soul and nature three distinct realms ununified by any organic relations? To ask this latter question is to answer it. For knowledge is necessarily systematic and unitary. Increase the intension and we know truth and reality. Increase the extension and we have three separate realms? No, the very change of intension itself, apart from the nature of knowledge, demands the unity or the correlation of all that is known. One can easily quote passages from the *Critique* showing how Kant practically and ofttimes illogically does all that we ask. He increases the extension. He decreases the intension. He increases both the extension and intension.

But we turn to a difficulty that faces us as soon as we speak of knowledge as being unitary and systematic. I know God and I know a mountain as realities, but how? As separate and unrelated objects for the same grade of knowledge or as the same object for various forms of knowing? The only solution is that of different grades of knowing and corresponding different grades of reality—noumena and phenomena. Noumena that do not appear are unknowable and unreal, and phenomena that are not the appearances or revelations of noumena are not even phenomena. We know phenomena as phenomeneal, revelatory of noumena, and we know noumena in their revelatory phenomena. If thought must think, as Kant admits, of an *ens realisimum*, we cannot know it apart from other realities. And if there are other realities we cannot know them apart from God. Leibnitz put the insight into the different grades of knowledge in his distinction between sense and understanding. He held that sense is only a primary and confused form of clear understanding. Clear and distinct understanding reknows or knows in a higher way the same experience that sense knows. The mountain as a separate distinct reality is reality only known by sense or confused understanding. But the mountain as known by clear understanding is known as an organic part of nature and nature itself is finally known as organically related to God. Thus phenomena and noumena must be the same experience, only for different grades of knowing. Noumena, *things in themselves*, are what are ultimately known as real, the real in all phenomena—in the totality of nature.

We know the limitations of Leibnitz' view. We know how it was corrected and fulfilled in the *Encyclopedia* of Hegel. But an exposition of Hegel's view must be given in a separate chapter. We only say here that the organic view of knowledge in all its extension and intension implies different degrees of knowing the same experience, giving us different grades of reality. There are no abysmal and impossible chasms between God, nature and man—only degrees of knowing. Experience is a unitary totality. Degrees of reality are of grades of knowing.

The presentation of the negative side and of the contradictory elements in the *Critique* is not a pleasant task for one who fully recognizes the mightiness and the epoch-making work of Kant in philosophy. It is a work that no student of philosophy dare fail to give repeated and prolonged study, every re-reading only increasing the admiration of the new " Copernican " turn he gave to philosophy. It will be a much more agreeable task for us to trace the development of the positive and constructive elements of his philosophy into that of absolute idealism—a world view in which God, man, and nature, are organic elements of total experience, and in which organism, system, God is the ground, the immanent reality of the whole of the process of nature and man, while yet transcendent as the eternal, and personal absolute. But we are here doing this unpleasant side of the work, because we wish to show how modern philosophical, theological, scientific and religious agnosticism find their scientific ground in the negative side of Kant's *First Critique.*

" Back to Kant," back to the *First Critique* and to a patient, prolonged study of it must every student of philosophy go who would understand modern idealism, which negates agnosticism by its epistemological ground-principle, that that which knows in us is the same as that which is known; that like is known by like, mind by mind and thus that there is no absolutely unintelligible element in experience or in its ultimate ground. " Back to Kant," too, has been the cry of the *" positivists,"* the empirical realists of the school of modern physical science. This we shall consider in our next lecture on Neo-Kantianism.

What Socrates was to Plato and Aristotle and all the lesser forms of Greek philosophy, that Kant is to Fichte, Schelling, Schopenhauer, Von Hartmann, Hegel and all the lesser lights in philosophy since his day. His place among the immortals in philosophy is assured. So far the neo-Kantian cult is correct. No one to-day has a right to have a world-view who has not thoroughly grounded his thought in that of Kant's *Critical Philosophy.* However he has got below it as the neo-Kantians have, or above it as absolute idealists have, it should at least be *through* it and not *round* it, from Hume to the modern empiricists. Professor James, as the exponent of what he terms *radical empiricism,* after speaking of Kant as a mere *curio,* says: " The true line of philosophical progress lies, in short, as it seems to me, not so much *through* Kant as *round* him to a point where we now stand. Philosophy can perfectly well out-flank him and build herself up into adequate fulness, by prolonging more directly the older English lines."[6] But Professor James does not say the last word in philosophy. Here he is only lisping the language of babes in knowledge. The fact is that a consistent empiricist or sensationalist should, logically, be speechless. For language and thought both imply common and universal elements and synthetic relations that cannot be found in mere or "radical empiricism."

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[6] Jour. Phil., Psychol. and Scientific Methods. Dec. 8, 1904.

THE LIMITATIONS OF LANGUAGE IN THE EXPRESSION OF TRUTH.[1]

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All the intelligent utterances of men, as a rule, assume the forms of words. But what are words? They are not reproductions of anything in the mind; they are merely symbols of something there. Moreover, they are symbols which, though used by several men in the same sense, by no means indicate that these men are representing through them the same thought or feeling. For instance, take such a word as "thirst" or "water." A dog, when he wants a drink, will run to and from a pail in which he has been accustomed to see water. He evidently has in mind a vision of this water, and not the word "water." He never uses the word, and, presumably, therefore, does not think of it. So with a child who cannot talk, or a savage whose vocabulary is limited. Grown people who understand language use the word, and, possibly, think of it. But, besides this, they think of something else. Just as clearly as the dog thinks of a pail, a child of a tumbler, or a savage of a river, they may think, according to the place in which each has been accustomed to sate his thirst, of a spring, a pitcher, or a saloon. This is the same as to say that the same general impression may appeal to the mind in the form of a different image, and, if this image were carefully described in language would be expressed to others in a different word. Add to this now the fact that thought in the mind is never at rest; that one thought is always passing into other thoughts; that one image is always connecting itself with other images; and we must conclude that often out of the same psychic impression revealing itself definitely as a single image, different minds may construct, by way of accretion, whole series of imaginative fabrics that in form are different.

Now notice that the first image, and, of course, all the later images, are results of each mind's appropriating for its purpose, objects or conditions that have been perceived in material nature. To each of these images, it may give a name, which name develops into what we term a *word*. Any one will recognize this who knows about the origin of words. The word *is*, for instance, comes through the German *ist*, the Latin *est*, and the Greek *esti*, from the Sanscrit word *as* indicating the act of breathing; and because whoever breathes exists, it means *to exist*. The Greek word for *spirit* meant originally *breath*; and as the breath, though unseen, evidently keeps the body alive, spirit came to mean the unseen principle of life—that without which, when it departs, the body dies. So on through large numbers of words till we come to those of modern origin like *understanding, uprightness* and *pastime.* It may be said, therefore, that, although the first psychic impression produced on the mind may be spiritual, the moment this impression assumes definite form and becomes an image, either in the mind's conception or as represented in a picturesque word, and still more as this image connects itself with other images, the results become more or less materialized in character. In this form, though occasioned by the spiritual influence representing it, they cannot be said to be spiritual themselves. They are merely illustrations drawn from the material world of something spiritual, which otherwise could not be communicated to us through the agency of eyes or ears. We are not justified, therefore, in claiming that these illustrations contain literal truth. Nor again are we justified in claiming that they contain no truth; or that they are not worthy of the most scrupulous study undertaken in order to ascertain what this truth is.

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[1] Extracts from a book in press entitled "*The Psychology of Inspiration.*" Funk-Wagnalls Co.

The principle involved in these statements has come to be virtually recognized by all thinkers. They acknowledge that, at every stage of intellection, a man is forced to use the forms of the material world in order to represent his mental processes. Otherwise they could not be perceived clearly nor understood intelligently even by himself, and much less by others to whom he would communicate them. Take any one of the more important of the emotions that actuate us, and we shall recognize this fact. Take that experience in some of the manifestations of which religious people believe that a man most resembles the Unseen One. Think how love, which is begotten often in a single glance, and is matured in a single thrill, gives vent to its invisible intensity. How infinite in range and in variety are those material forms of earth, air, fire and water which are used by man as figures through which to represent the emotion within him! What extended though sweet tales, what endless repetitions of comparisons from hills and valleys, streams and oceans, flowers and clouds, are made to revolve about that soul which, through their visible agency, endeavors to picture in poetry spiritual conditions and relations which would remain unrevealed but for the possibility of thus indirectly symbolizing them. Nor is it man alone who is thus obliged to use the forms of material nature in order to reveal the workings of his spirit. He himself does this only, as it were, by way of imitation; only because he partakes, as it were, of the nature and therefore of the methods of the Creative Spirit to which all men and all material nature owe their origin. If what has been said be true of the expression of human love, why should not the Great Heart whose calm beating works the pulses of the universe, express divine love through similar processes evolving infinitely and eternally into forms not ideal and verbal, but real and tangible—in fact, into forms which we term those of nature?

Do we not all, subtly, at least, believe in the two statements just made? Do we not believe that material nature furnishes the representative implements through which man creates language, and that it furnishes also the actual implements through which the creative spirit produces a language speaking, though in a less articulate and distinct way, to our thoughts and emotions? Have not all who can understand this passage of Wordsworth accepted it as virtually true?

> "I have learned
> To look on nature, not as in the hour
> Of thoughtless youth; but hearing oftentimes
> The still, sad music of humanity.
>
> . . . . And I have felt
> A presence that disturbs me with the joy
> Of elevated thoughts; a sense sublime
> Of something far more deeply interfused,
> Whose dwelling is the light of setting suns,
> And the round ocean, and the living air,
> And the blue sky, and in the mind of man:
> A motion and a spirit, that impels
> All thinking things, all objects of all thought,
> And rolls through all things."
> —*Lines composed a few miles above Tintern Abbey.*

But now, if all men, as a rule, express themselves by appropriating material forms of nature through which to represent their thoughts, why should not an inspired man do the same? And if the Divine Spirit find expression in the "unwritten word" through material forms, why should not the same, or something in analogy with the same, be used in the methods of expression in the "written word?" Why should not both these questions be answered affirmatively, especially in view of the fact that in the "written word" language must be used, which language is itself necessarily constructed out of these same material forms in order to represent, so as to be seen or heard, that which cannot in itself be seen or heard? This argument from analogy certainly seems approximately rational.

Of course, if this principle can be applied to single words, it can be applied to whole conceptions which series of words represent. In what way, judging from results, do men usually differentiate the influence of religious leaders of the highest class from that of those who are termed fanatics? Is it not by showing that the latter are not "practical." What is meant by this word as thus used? What but that the fanatics do not accomodate their speech and action to existing emergencies, i. e., to surrounding material conditions, to facts as discovered by investigation, and comprehended within the sphere of what we term *knowledge*? Only as that which takes its rise in the realm of spirit is correlated by a man to that which is in the realm of matter, so as to find expression through it, can he do for all his fellows that which a man of intelligence should do. This is true as applied to him not only as a thinker, but as a teacher of others who should think. No one can cause either himself or his neighbor to apprehend the full import of spiritual conditions whose mind is not able to do, in some degree, as did the Christ when he never spake without a parable (Mark 4:34), i. e., without indicating a correspondence between spiritual and material conditions. Men cannot fully recognize the religious connection between mercy and salvation, between faith and love, unless they can perceive them illustrated through analogies of the same in secular connections. They cannot fully realize the relations between God and man, unless they can see these relations imaged in the relations between man and man, or, if they be Christians, between the Great Master and man. Indeed, religion cannot become in the highest sense rational and enlightening, unless it be led by certain ideals: and ideals are always earthly vessels with heavenly contents; outlines modelled on the lower world, filled in with light and color from the upper; figures of the actual transfigured by the potential.

Notice, however, that the condition which has been stated—the necessity of expressing spiritual truth in a material form carries with it the necessity of expressing this truth in a limited way. But nothing can be expressed in a limited way that does not fail to express, in some particulars, the whole truth; and, so far as it fails to do this, it cannot fail, at times, to seem at variance with other statements that contain the parts of the truth omitted in it. For instance, in the Bible, God is termed sometimes a sovereign whose actions are limited by only his own will (Dan. 4:35), and, sometimes a father whose actions are limited by the pity that he has for his children (Ps. 103, 13; Matt. 6:32); the Christ is termed, sometimes, the only son of God (John 3:18) and, sometimes, the first born among many brethren (Rom. 8:29); and Abraham is termed, sometimes, the father of the Israelitish race (Is. 41:8) and, sometimes, of those who are not members of that race (Rom. 14:16). Taken as illustrations used to suggest relationships in an unseen spiritual world, through what we can see and know of the relationships of father, son, brother, or children in a material world, these expressions may prove exceedingly helpful; but taken as statements of literal fact they are contradictory; and taken as arguments to prove exact conditions in the spiritual world, they may be very misleading. No better proof of this fact can be afforded than by the many books and sermons written to show that doctrines like that of "election," "imputed righteousness," or "eternal generation" do not involve the irrational or erroneous conclusions that some have supposed, but have been misunderstood. Of course, they have been misunderstood; but might not a more thorough remedy for the misunderstanding be found by tracing it back to the extreme and erroneous literalism in which it first took rise. In order to show due regard or reverence for spiritual relationships which can only be figured or symbolized through reference to conditions in the material world, it is not necessary to ignore practically, or to deny, the plain statement in the scriptures that "eye hath not seen, nor ear heard, neither have entered into the heart of man, the things which God hath prepared" (I Cor. 2:9.).

PAUSANIAS; A SECOND CENTURY BAEDEKER.

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Every traveller to European lands carries with him his Baedeker, that indispensable companion which answers all his questions and solves all his problems, telling him where to stop, what to see and how to get from one place to another. It may not be generally known that we have a similar handbook to ancient Greece, which is an indispensable guide for the archaeologist and the traveller, and has been the key which has unlocked the treasures of many an ancient site. This is an age that is intensely interested in the monuments of ancient civilization which are constantly coming to light. We are sometimes told that love for the classics in our universities and colleges is steadily declining. If this be true, it applies chiefly to matters of grammar and to arid philological problems. There is an enthusiastic and ever-growing interest in archaeological discoveries, and in the fascinating life and art of the Greeks and Romans. Hence a second century guide-book to ancient Greece—the most absorbingly interesting of all the lands visited by the archaeologist and the traveller who desires to search into the origins of our civilization and our art—appeals not merely to the Greek scholar and explorer, but to all lovers of art and letters.

The *Description of Greece* by Pausanias, the second century Baedeker, has come down to us in ten books. It has been translated into English with an extensive commentary in six octavo volumes by Mr. J. G. Frazer, formerly Fellow of Trinity College, Cambridge, so that the wealth of information it contains is accessible to all people of culture. When Aldus Manutius wrote the preface to the *editio princeps* of this work, which appeared in 1516, he departed from the usual monotony of prefatory statements to characterize it as an "*opus antiquæ raræque eruditionis thesauros continens.*" The modern reader will not regard this as extravagant praise, for it imparts to us rare information about all the celebrated sites of ancient Greece, when its monuments still retained much of the splendor and freshness of the earlier times.

The *Description of Greece* is a detailed account of the sites ordinarily visited and the objects usually seen by the traveller who desired to make an extensive tour throughout Greece. As the writer is supposed to be coming from Asia Minor across the Aegean Sea to the Greek Mainland, his account begins with Sunium, the promontory of Attica. Thence he proceeds to Athens. Book I is devoted to the description of Athens and Attica. From Attica the traveller journeys southward by way of Megaris to Corinth and the Argolid, described in Book II.

His Peloponnesian tour follows much the same route which travellers of our day usually take, embracing Laconia (Book III), Messenia (Book IV), Elis (Books V, VI), Achæa (Book VII) and Arcadia (Book VIII). Then follows a second tour to the principal cities of Central Greece, starting from Athens in the same manner as modern travellers would journey. Here the writer's chief attention is absorbed by Thebes in Boeotia (Book IX) and by Delphi in the district of Phocis (Book X). The date of the composition of the work is not definitely known, but can be inferred from certain references to historical events in his works. From these it can be safely asserted that the composition of the *Description of Greece* extended over a period of not less than fourteen years (160-174 A. D.) and probably occupied a much longer time; that Book I, known as the *Attica*, was issued first as an independent treatise and a few years elapsed before Pausanias undertook the larger task, and that the rest of the books were written in the order in which they stand.

The regions of Western and Northern Greece are left entirely out of consideration, for countries like Acarnania, Aetolia, Epirus and Thessaly were regarded as semi-barbarous by the cultured Greeks of Athens and Corinth, and played no prominent part in the art and civilization of Hellas. Topographical directions are not always exact; yet by mentioning in order the name of districts, of cities and of monuments in the various countries, Pausanias throws much light on the geography and topography of ancient Greece.

Though the work itself is so voluminous and so universally known, our knowledge of the author is very limited. The book shows that he was an intelligent traveller of the days of Hadrian and the Antonines; its style gives us some insight into his personality, but as to the author's family, birthplace, citizenship and pursuits in life we are left in almost total ignorance. An occasional allusion, however, conveys some intimation. If we inquire, for example, whence he came he gives us a hint in Book V, Chapter 13, " In my country there are still left signs that Pelops and Tantalus once dwelt in it," etc., where it is suggested that his native land was the territory about Mount Sipylus in Lydia, and mention is made in what follows of natural features and monuments pertaining to this region. This statement is strengthened by many passages in which he recurs to the scenery and legends of Lydia. We conclude, therefore, that he was a Lydian by birth; but whether he was a native of Magnesia, the important city at the northern foot of Mount Sipylus, or of Thyatira, or of some less known town, is not to be ascertained. With this limited information as to the personality of our author we must rest content.

That Pausanias has given to the world a work of unique value is manifest to anyone who notes its contents. We have here a rich mine of antiquarian, mythological, historical and artistic lore, about Athens and the Acropolis; about Mycenæ, home of King Agamemnon (and this passage gave rise to Dr. Schliemann's wonderful discoveries); about Olympia, the center of Greek worship and site of the Olympic games; about Delphi, seat of the Delphic oracle, not to speak of the less important places. The very nature of the subject-matter arouses inquiry as to the author's aim in preparing his work. Yet the answer is nowhere clearly given by him. He begins his work without a preface; he concludes without an epilogue. Probably his work was left unfinished and he was given no opportunity to revise it; probably while it served its purpose, the author felt there was no need of explanatory remarks. Hence, the answer to our question is largely a matter of inference; but we can, at any rate, gather from utterances here and there what was the author's general purpose and how his method developed as his grasp of the subject increased.

Thus he tells us in one passage (1, 26, 4) that it was his purpose to describe the whole of Greece as he had the Acropolis. Again after his account of Athens and Attica, he adds (1, 39, 3): "Such are, in my opinion, the most famous of the Athenian traditions and sights: from the mass of materials I have aimed from the outset at selecting the really notable." Later, as a preface to his description of Sparta, he refers to this statement, and outlines his aim and method more definitely (3, 11, 1): "To prevent misconceptions, I stated in my *Attica* that I have not described everything, but only a selection of the most memorable objects. This principle I will repeat before I proceed to describe Sparta. From the outset I aimed at sifting most valuable traditions from out of the mass of insignificant stories which are current among every people. My plan was adopted after mature deliberation and I will not depart from it." From these passages and from a study of the contents of the work it becomes clear that it was the purpose of Pausanias to describe all the most notable objects and to narrate for the benefit of other travellers all the most memorable traditions which were extant at the time of his travels in Greece.

This was a vast undertaking, especially so in the case of Attica, the first country he undertook to describe. Here he was bewildered by an embarrassment of riches before he had arrived at the best method of treating the data at hand. Hence, in Book I the author's method is not so clearly defined as in the later books. Beginning with Book II, he regularly prefaces his account of every important city with an historical sketch and follows strictly the topographical order of description. But in the case of the *Attica* there is no historical introduction whatever; though the topographical order is in the main observed in describing Athens, it is not followed in his treatment of the rest of Attica. At times the course of description is confused, as when he interrupts his account of the townships to describe the mountains of Attica. Again, he mentions fewer notable objects in proportion to the total number in Athens than he does in any other important centre of Greece, and his descriptions of notable monuments in Athens are shorter than those in the remaining books. The explanation of the defects of the *Attica* is, of course, that the author is finding himself in his new work, and has not altogether arrived at a definite plan. The topographical method followed in the description of Athens reveals the author's purpose in preparing the work. Thus he begins by describing the harbors of Athens and the objects of interest on the roads leading from the harbors to the city. He next enters the principal gate and proceeds by a broad avenue to the Market-place, which he treats in great detail. Thence he traverses the territory east of the Acropolis, known as the City of Hadrian. A description of the southern slope of the Acropolis finally brings him to its principal entrance, and, having entered, he devotes to the objects of interest in the sacred precinct the maximum of attention. He concludes his account of Athens by describing the suburbs of the city. Let us compare this description with the description of Athens in Baedeker's Greece. The writer of this work gives first a historical sketch of the city. He then describes it in several sections: a, From the Royal Palace round the south side of the Acropolis; b, The Acropolis; c, From the Palace through the Town to the Theseum; the Hill of the Nymphs, the Pnyx, and the monument of Philopappus; d, Modern Quarters of the Town; e, Walks near Athens.

These resemblances show that we have in Pausanias the prototype of Baedeker and Murray. The second century was an age of travel, like our own, and many needed systematic direction to help them on their way. The public-house system of the country was poor, but private hospitality, as in the earlier days, made some amends. Accordingly, the description of inns and other accomodations which Dionysus in the *Frogs* of Aristophanes feels to be such a desideratum and which our Murray or Baedeker offers in great detail, is wanting; but in other respects the likeness between the ancient and the modern *cicerone* holds. The work was meant to be primarily a guide-book for the generally frequented parts of Hellas, with special reference to works of art, like the modern Burckhardt. To gratify the intellectual curiosity of his readers, Pausanias fills his volume with mythical, antiquarian, and historical lore, and he doubtless felt that his work would be serviceable to the historian as well as to the traveller. Yet his main purpose was, without doubt, to provide a guide-book for visitors to the historic sites of Greece.

The literary style displayed in the book before us is influenced partly by the nature of the subject-matter, partly by the character of the author as reflected in his work. Pausanias is revealed as an unimaginative man, but one deeply interested in antiquarian lore, who set out on his travels with the purpose of "doing" Greece and of giving others the benefit of his reading and observation, and who kept at it with heroic persistence. He permitted no curious legend to escape him, and gathered information from every source. He carefully studied his predecessors in historical prose, especially Thucydides and Herodotus, and laboriously sought to cultivate a good style. But he falls hopelessly short of the vigorous expression of the former, and the sweetness and lucidity of the latter. There is a sense of strain about his style. As Frazer so well puts it, "The sentences are devoid of rhythm and harmony. They do not march, but hobble and shamble and shuffle along. At the end of one of them the reader is not let down easily by a graceful cadence, a dying fall; he is tripped up suddenly and left sprawling, till he can pull himself together, take breath, and grapple with the next. It is a loose, clumsy, ram-shackle style, without ease or grace or elegance of any sort."[1] Yet one would never imagine this who confines his reading to the elegant, fluid prose of Frazer's translation.

In modern times Pausanias's trustworthiness and literary independence have been vigorously attacked by eminent German scholars. Scaleger, for example, characterized him as being "*omnium Graeculorum mendacissimum.*" These criticisms find expression chiefly in the work of Kalkmann (*Pausanias der Perieget,* Berlin, 1886), who argues that Pausanias had travelled and seen very little in Greece, but had compiled the bulk of his work from the manuals of other writers, and had added a few hasty jottings of his own to give his descriptions a convincing atmosphere. The charges of Kalkmann, however, which were a severe impeachment of Pausanias's moral character, as well as of his literary ability, have been successfully refuted by Gurlitt (*Ueber Pausanias,* Graz, 1890), by Heberdey (*Die Reisen des Pausanias in Griechenland,* Vienna, 1894), and by Frazer in the introduction to his translation of Pausanias.

In regard to the historical passages, Frazer shows that Pausanias drew his accounts of the mythical and heroic ages largely from the poets; that Herodotus is the historian most frequently cited by him; and that Thucydides and Xenophon were often consulted; that he also refers to numerous other historians, and cites local histories again and again; and that he made extensive use of inscriptions, consulted writers on art and got information from local guides.

Regarding next the descriptive or topographical passages, Frazer considers whether Pausanias derived his knowledge from observation, from books, or from both. The author himself gives no full or direct answer to these questions. He neither professes to have seen everything he describes, nor does he acknowledge having borrowed any of his descriptions from previous writers, whom he barely alludes to and never mentions by name. Yet he affirms that he saw personally certain things he describes; and to have seen certain things implies that he saw others. There are descriptions which Pausanias may have taken from books, but there is no description extant so like in form and substance to what Pausanias has written that one can say he copied from it. Frazer considers in detail a number of passages which, others have thought, bear traces of having been derived either wholly or in part from written documents rather than from personal observation, and concludes that in none are the indications so clear as to amount to a proof of borrowing. Frazer discusses in considerable detail the predecessors whom Pausanias ought to have consulted. He concludes that there is no support whatever for the theory that Pausanias copied outright, and we are not even justified in supposing that he was acquainted with the writings of his learned predecessors.

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[1] See Frazer, Pausanias's *Description of Greece*, vol. I, Introduction, p. lxix.

Another theory of Kalkmann's that obtained some vogue was that our author did not describe Greece as it was in his own time, but as it was a century or two earlier, when his alleged sources were composed. This theory is more susceptible of verification, namely, by proving that certain things Pausanias speaks of as existing had ceased to exist before his time. Kalkmann, for example, thus attacks the description of the Piraeus. It had been burnt in 86 B. C. and was in a ruined condition when seen by Strabo; how then could Pausanias's account of its temples and colonnades apply to his own time? Frazer, in reply, shows what great changes were possible in two hundred years, and how the Piræus had regained prosperity under beneficent Roman emperors. He also gives numerous proofs, from existing monuments and otherwise, that Pausanias described Greece as it was in his own age.

We may say, then, that at present a conservatively just view has succeeded the bitter outcry against our author's alleged untrustworthiness. Pausanias cannot be regarded as an independent creative spirit, originating a great work for the benefit of mankind. He is rather a true child of his time, a plodding collector, somewhat superficial and credulous, with a propensity for the archaic and the mystical, but withal an intelligent and inquisitive traveller, who rambled through land and city and carefully noted what to him appeared worth seeing and recording. The extant monuments prove that his description of Greece is founded primarily on personal observation. Yet he did not neglect his predecessors and got together historical and mythological material out of handbooks. He also consulted, as did Herodotus, local priests and guides in his eager search for information. As a result, he has handed down to modern times a readable and instructive description of travel, presenting a fairly coherent picture of ancient Greece, and a work which is indispensable to the traveller and investigator.

We cannot better conclude this brief sketch of the work of Pausanias than by quoting the appreciation of Frazer:[2] "Without him the ruins of Greece would for the most part be a labyrinth without a clue, a riddle without an answer. His book furnishes the clue to the labyrinth, the answer to many riddles. It will be read and studied so long as ancient Greece shall continue to engage the attention and awaken the interest of mankind; and if it is allowable to forecast the results of research in the future from those of research in the past we may venture to predict that, while they will correct the descriptions of Pausanias on some minor points, they will confirm them on many more, and will bring to light nothing to shake the confidence of reasonable and fair-minded men in his honor and good faith."[3]

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[2] Frazer, vol. I, p. xcvi.

[3] For a more detailed and technical treatment of Pausanias's Description of Greece, the reader is referred to the author's edition of *The Attica of Pausanias*, shortly to appear from the press of Ginn and Company.

NOTES ON SOME SEVENTEENTH-CENTURY USES OF WORDS IN FRENCH.

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Autre. The use of *un autre,* feminine, is common in the early editions of Corneille. It occurs also in Racine's *Andromaque,* 1378. In Corneille's *Veuve,* 1733, is a curious instance of a masculine participle (the rhyme-word) agreeing with feminine *un autre:* "Mais aujourd'hui qu'un autre [femme] en sa place reçu." There are also several cases of pronominal *l'un,* fem., in connection with *l'autre,* in Corneille. One is in Mélite, 908-909:

> "Je ne sais plus qui croire ou d'elle ou de sa plume:
> L'un et l'autre en effet n'ont rien que de léger;"

Another is in *la Galerie du Palais,* 1580-1581 var.:

> "J'aurai de vous ma grâce, ou la mort de ma main.
> Choisissez, l'un ou l'autre achèvera mes peines;"

Further examples are *la Place Royale,* 799 var. and *Médée,* 1230 var. In all these cases *l'un* is followed by *et* or *ou,* and was doubtless pronounced like *une.*

Déguiser. The usual meaning of *déguiser* in the seventeenth century, was, as now, "disguise." But in a number of passages in Corneille, Molière and Racine, the meaning seems rather "conceal" simply, without the additional idea of disguising. The two meanings are so close that it is hard to differentiate, but in the following passages "conceal" would seem to make rather better sense:

> "J'ose me déguiser jusqu'à son parricide."—*Rodogune,* 720.
> "Je ne puis déguiser que j'ai peine à vous suivre."—*Polyeucte,* 674.
>
> "L'image de l'affront lui revient, et sa fuite
> Tâche à me déguiser le trouble qui l'agite."—*Dépit amoureux,* 897.

"et j'aurais lieu de plainte, Si . . . Vous alliez me trahir, et me déguiser rien."—*Misanthrope,* 303. "Mais, s'il faut ne te rien déguiser, Mon innocence enfin commence à me peser."—*Andromaque,* 771.

Ennui. In *Tartuffe,* 503-504, occur the lines:

> "Ferez-vous possesseur, sans quelque peu d'ennui,
> D'une fille comme elle un homme comme lui?"

No edition of the play that I have seen gives the meaning "anxiety" here, though it seems absolutely required by the context, i. e., by Dorine's plain-spoken language in 505 et seq.: "Et ne devez-vous pas . . . de cette union prévoir les conséquences?" etc. This meaning is given in Nicot's *Thresor*, and is not uncommon in Corneille; e. g. *Cid*, 448, *Horace*, 834, *Polyeucte*, 23.

Ombrage. In several passages in Corneille and Molière, *ombrage* seems to have the meaning "jealousy" (given in Cotgrave), in the usual modern sense of the word, rather than the more ordinary "suspicion" or "offence." Such are: "Ton esprit amoureux n'aura-t-il point d'ombrage?"—*Cid*, 498. "Quoi! vous me soupçonnez déjà de quelque ombrage?"—*Polyeucte*, 609. "Madame, Alcippe vient; il aura de l'ombrage."—*Menteur*, 185. "ce fils qui déjà lui donne tant d'ombrage."—*Nicomède*, 1288. "témoigner de l'ombrage, C'est jouer en amour un mauvais personnage."—*Dépit amoureux*, 125. "Qu'injustment de lui vous prenez de l'ombrage!"—*Misanthrope*, 489.

The "Norman Rhyme." In Le Boulanger de Chalussay's *Élomire Hypocondre*, Act III, scene II, the précieuse Alphée, who everywhere substitutes *l* for *r*, says *tlouvel*, *admilel*, etc. This would indicate that at that time, 1670, final *r* was pronounced in *-er* infinitives, for if it had been silent there would have been no point in substituting the *l* in print. This may throw a little light on the vexed question of the "Norman rhyme."

NOTES ON THE STYLE OF SENECA THE PHILOSOPHER.*

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The prominent position of the younger Seneca in the history of Latin literature has been frequently attested. He was "the most brilliant figure" of his time, and "a faithful image of his period," who "purposely wrote in harmony with the prevailing taste and successfully courted the applause of his contemporaries."[1] By developing the tendencies started by Ovid he became the creator of a new school of rhetoric;[2] and a thorough examination of his language is necessary before any certain judgment can be passed upon Silver Latinity, without an understanding of which no complete history of the Latin language is possible.[3] Few of the Roman writers attained greater brilliancy of style than he, not only because of the sententious brevity by which he intentionally checked the flowing torrent of Ciceronian eloquence, and the careful attention which he paid to rhythm and the collocation of words, but also because of the poetic coloring which he gave even to his prose, as seen especially in the boldness of his metaphors.[4] He was generally regarded in later times as the literary representative of the early empire, being better known in the Middle Ages than even his great rival Cicero; and became the object of more hostile criticism on the one hand and enthusiastic admiration on the other than any other author of antiquity. In the bitter contest which was waged in the days of Trajan between the Modern party in literature and the Reactionaries, his name and that of Cicero were the rallying-cries of the opposite schools, and he and Tacitus are to be considered the best representatives of the "modern style."[5] Indeed, Tacitus himself, like Pliny and Juvenal, was an imitator of Seneca;[6] while, on the other hand, the inimical attitude of the professional rhetoricians is shown by Quint. 10, 1, 126 f., Fronto, p. 155 f. (Naber) and Gell. N. A. 12, 2, 1 f.

We should have expected that the style of an author of such prominence would long ago have received a careful and exhaustive investigation, but comparatively little attention has been given to it. Since H. Rieger's dissertation on Seneca's use of the causal particles, published in 1889, the only important contributions have been by G. Reinecke (1890), on the conjunctions; J. Jöhring (1894), on *ut, ne, quin,* and *quominus;* J. Hammelrath (1895), on the tenses; F. Rech (1895), on the preposition *in;* H. Weber (1895), "De Senecae philosophi dicendi genere Bioneo"; and R. B. Steele (1902), on chiasmus in epistolary Latin. A large part of the field, therefore, still remains untouched, especially in the very region which, in an author like Seneca, ought to be most inviting, as well as most productive, namely, his rhetorical peculiarities. The present article is an attempt to add something to our knowledge along these lines, and, as it appeared best to undertake a somewhat thorough investigation of a limited portion of the subject rather than a more superficial consideration of the whole, it is confined to Seneca's use of metaphor and comparison in the Letters to Lucilius.

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[1] Teuffel-Warr, "History of Rom. Lit.," §287 ff.

[2] H. M. Kingery, "The Medea of Seneca," p. 19.

[3] H. Rieger, "Observationes Annaeanae," p. 5.

[4] M. Zimmermann, "De Tacito Senecae philosophi imitatore," p. 2.

[5] E. Norden, "Die antike Kunstprosa," p. 306-312.

[6] A. Gercke, "Seneca-Studien," p. 133 ff.; cf. Zimmermann, op. cit.

The Letters are selected for this purpose because they are generally recognized as the most distinctly characteristic literary work of Seneca and as "giving the fullest reflection of the writer's idiosyncrasy."[7]

The importance of a study of metaphor and the kindred figure, simile or comparison, has been often emphasized, even as far back as Aristotle (cf. Poetics, chap. 22); and the great value which a complete index of Latin metaphors would have for a student of that language is mentioned on p. 504 of Nägelsbach-Müller's "Lateinische Stilistik." Moreover, a list of these figures as they are found in the works of an individual author throws a great deal of light upon his own range of thought and creative talent, and upon the civilization of the period in which he lived.[8] Accordingly, the main object of the present investigation is to show how extensively Seneca made use of metaphors and comparisons, the spheres from which he derived them, and the way in which he handled them; while at the same time it seeks to make a collection of examples which may contribute toward our understanding of Latin figurative language in general, and of Silver Latinity in particular. For this reason "metaphor" is interpreted rather broadly, so as to include some cases which strictly belong under the head of metonymy, as well as many tropical expressions which, though somewhat trite and commonplace, could not be omitted from any comparative study of Latin phraseology and style; and the term "comparison" has been used instead of "simile," so as to admit instances of what G. O. Berg, in his dissertation on "Metaphor and Comparison in the Dialogues of Plato" calls "didactic comparisons."

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[7] Teuffel-Warr, op. cit. §289.

[8] Cf. Baeker, "Die Metaphern in den Satiren des Horaz," p. 1; J. Franke, "De Tib. Silii Ital. Punicorum tropis," p. 5; O. Schmidt, "Metapher u. Gleichnis in den Schriften Lukians," p. 1; H. L. Wilson, "The Metaphor in the Epic Poems of P. P. Statius," p. 1.

The number of examples resulting from this plan is so large that a systematic arrangement of the material becomes essential. Of the various methods that have been employed in the classification of metaphors, the one best suited for our present purpose is that used by H. Blümner in his "Studien zur Geschichte der Metapher im griechischen" (Leipzig, 1890), and it is accordingly adopted here, with such minor changes as the character of the material demands. The general divisions are as follows: I. Man, (A) Soul, Mind, Emotions, (B) The Body and its Conditions, (C) Shelter and Clothing, (D) Family and Daily Life, (E) Religion and Mythology, (F) Farming, Hunting, Fishing, (G) Arts and Trades, (H) Commerce and Travel, (I) Warfare, (J) Politics and Law; II. The Realm of Nature, (A) The Animal Kingdom, (B) The Vegetable Kingdom, (C) The Mineral Kingdom, (D) The Elements, Weather, (E) Land and Sea; III. General Notions, (A) Properties of Material Objects, (B) Words indicating General Actions.

A study of the examples, including over five thousand metaphors and between three and four hundred comparisons, arranged under these heads and their appropriate subdivisions, leads to the following conclusions:

The range of Seneca's tropes and illustrations is very large, covering, with a few exceptions, practically the entire field of the private and public life of the ordinary Roman, and demonstrating the "multa rerum cognitio" which is conceded to him by Quintilian (Inst. Or. 10, 1, 128). His favorite sources for figurative expressions are the human body and its affections, especially diseases and their cure (Seneca himself was always more or less of an invalid);[9] the relations of master and slave; the legal and financial spheres; warfare and conflict; and the various phases of travel by land and sea. Not only is the total of metaphors and comparisons a large one, but the great number and variety of the individual expressions used is particularly noteworthy.

The great majority of the examples are drawn from the language of daily life (the proverbial character of many of them being manifest), and from the commonplaces of the teachers of rhetoric and philosophy. This was to be expected of an avowed Stoic, and the son of the author of the "Controversiae" and "Suasoriae," the pupil of Sotion, and the enthusiastic admirer of Fabianus. He himself does not hesitate to indicate, in a number of instances, the author of the figure which he employs. The "popular" element in his style, which is criticized by Gellius (N. A. 12, 2, 1), appears in this sphere, as elsewhere; though here it may well be regarded as a merit rather than a fault. Seneca's claim to distinction as regards the use of metaphor and simile is not on the ground of originality in their invention, but is based upon his skill in the application and variation of those already familiar, and the vividness and detail of some of the descriptions with which he accompanies them. The latter characteristic is seen in such passages as Ep. 13, 2-3: "Non potest athleta magnos spiritus ad certamen adferre, qui numquam suggillatus est: ille, qui sanguinem suum vidit, cuius dentes crepuere sub pugno, ille, qui subplantatus adversarium toto tulit corpore nec proiecit animum proiectus, qui quotiens cecidit, contumacior resurrexit, cum magna spe descendit ad pugnam. Ergo, ut similitudinem istam prosequar, sæpe iam fortuna supra te fuit, nec tamen tradidisti te, sed subsiluisti et acrior constitisti. Multum enim adicit sibi virtus lacessita"; Ep. 49, 6-9: "Non vacat mihi verba dubie cadentia consectari et vafritiam in illis meam experiri. 'Adspice qui coeant populi, quæ mœnia clusis ferrum acuant portis.' Magno mihi animo strepitus iste belli circumsonantis exaudiendus est. Demens omnibus merito viderer, si cum saxa in munimentum murorum senes feminæque congererent, cum iuventus intra portas armata signum eruptionis expectaret aut posceret, cum hostilia in portis tela vibrarent et ipsum solum suffossionibus et cuniculis tremeret, sederem otiosus et eiusmodi quæstiunculas ponens: 'quod non perdidisti, habes. Cornua autem non perdidisti: cornua ergo habes' aliaque ad exemplum huius acutæ delirationis concinnata. Atqui æque licet tibi demens videar, si istis nunc inpendero operam: et nunc obsidear. Tunc tamen periculum mihi obsesso externum inmineret, murus me ab hoste secerneret: nunc mortifera mecum sunt" (cf. Ep. 82, 4-5); Ep. 70, 2-4, where life is compared to a voyage, and Ep. 107, 2-3, where it is compared to a journey; and Ep. 100, 5-6, where the style of Fabianus is compared to a well-proportioned house.

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[9] Cf. K. F. H. Marx, "Uebersichtliche Anordnung der die Medizin betreffenden Aussprüche des Philosophen L. Ann. Seneca."

We gain an important clue to our author's method and motive in using these figures, from his own words in Ep. 59, 6 (commenting upon a letter from Lucilius); "Invenio tamen translationes verborum ut non temerarias ita quæ periculum sui fecerint. Invenio imagines, quibus si quis nos uti vetat et poetis illas solis iudicat esse concessas, neminem mihi videtur ex antiquis legisse, apud quos nondum captabatur plausibilis oratio: illi, qui simpliciter et demonstrandæ rei causa eloquebantur, parabolis referti sunt, quas existimo necessarias, non ex eadem causa qua poetis, sed ut inbecillitatis nostræ adminicula sint, ut et dicentem et audientem in rem præsentem adducant"; and especially Ep. 75, 2: "Si fieri posset, quid sentiam, ostendere quam loqui mallem." It is his desire to visualize, as it were, the ethical and moral principles which he advocates, and to emphasize and perfect the conception of them by presenting them from as many different angles as possible, which leads him to make such large use of illustrative figures. Sometimes, indeed, this desire, in connection with the comparatively limited circle of topics which he treats, causes him to overdo the matter in a way which justifies Fronto's criticism of him (p. 155 f., Naber) as "redundantem hominem" whose figures "eandem sententiam miliens alio atque alio amictu indutam referunt." Yet, on the whole, there is sufficient variety to prevent monotony, for we do not often find the same figure applied again to a given subject in the same way; and sufficient good taste to prevent his falling into the faults of "verba prisca aut ficta . . . et translationes inprobas figurasque dicendi" which he criticizes in Ep. 108, 35. In length, his tropes and similes vary from single words to passages extending through several sections of the text, as Ep. 81, 17-26.

Finally, we may mention the following characteristics:

(1) Massing of several metaphors or comparisons on the same theme. Examples of this are: Ep. 1, 1 tempus . . . auferebatur . . . subripiebatur . . . excidebat, collige et serva . . . tempora eripiuntur . . . subducuntur . . . effluunt; Ep. 2, 3 (discursive reading compared to travel, food, medicine, curing a wound, a plant); Ep. 16, 3 philosophia . . . format et fabricat . . . disponit . . . regit . . . demonstrat . . . sedet ad gubernaculum . . . derigit cursum; Ep. 33, 7-10, where a series of figures is employed to support the proposition that the Epicurean writings are not superior to those of the Stoics because of the fact that they are better adapted for quotation; Ep. 66, 43, where the idea of death is variously expressed by *decessit, mors . . . præcidit . . . interrupit, solutus est, continuata mors somno est, extinxit, desinunt;* Ep. 71, 3 (the necessity of having a definite plan in life illustrated by the painter, the archer, and the sailor); Ep. 71, 12-14 (the alteration in the character of the Roman State compared to the changes of the earth, the sky, heavenly bodies, the universe, age, the human race); Ep. 76, 8-9 (man compared to a vine, a deer, beasts of burden, a dog, lion, peacock, horse), cf. Ep. 79, 8-9 and 124, 10-11; Ep. 91, 9, where a number of different metaphorical phrases are applied to the destruction of cities; Ep. 97, 10-11 (the art of living contrasted with that of the pilot, the physician, the orator, and the advocate).

(2) Combination of metaphor and simile, the one leading to the other, or interwoven. Examples of this are too numerous for us to do more, in this place, than mention, by way of illustration, Ep. 66, 26-27, as a case of metaphor following simile; and Ep. 80, 7-8, where a simile is introduced by a metaphor (*hic humanæ vitæ mimus*).

(3) Revitalizing of trite metaphors, as: Ep. 15, 9 cæca cupiditas . . . præcipitat; Ep. 34, 2 ego quom vidissem indolem tuam, inieci manum, exhortatus sum, addidi stimulos nec lente ire passus sum, sed subinde incitavi: et nunc idem facio, sed iam currentem hortor; Ep. 42, 5 meministi, cum quendam adfirmares esse in tua potestate dixisse me volaticum esse ac levem et te non pedem eius tenere, sed pennam. Mentitus sum? Pluma tenebatur, quam remisit et fugit; Ep. 45, 5

nectimus nodos et ambiguam significationem verbis inligamus ac deinde dissolvimus; Ep. 58, 1 verborum . . . paupertas, immo egestas; Ep. 71, 25-26 omnia rerum adversarum onera rigida cervice sustollat . . . succidere . . . incurvari et succumbere . . . stat rectus sub quolibet pondere . . . ferenda . . . cadere . . . cecidisse . . . vires . . . oneri ferendo, cf. Ep. 76, 30, and 78, 13 and 17; Ep. 79, 18 tenue est mendacium: perlucet, si diligenter inspexeris: Ep. 84, 13 confragosa in fastigium dignitatis via; Ep. 94, 50-51 consecuti . . . pervenitur . . . proficienti . . . via . . . perveniat . . . regi debet; Ep. 100, 10 (oratio) non est violenta nec torrens, quamvis effusa sit; non est perspicua, sed pura; Ep. 109, 16 videre . . . excæcat . . . dispectum . . . vident, cf. Ep. 102, 28.

LATE SEVENTEENTH CENTURY COMEDY.

By DeWITT C. CROISSANT, A.B.,
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Not such a long time past it was customary for all romanticism-mad critics to decry Pope as in no sense a poet. The changed attitude towards him indicates that a reaction is setting in, and that possibly we are becoming less romantic in our literary taste. How far this appreciation of the neo-classical school will go it is impossible to predict. But that we should in time appreciate the minor exponents of neo-classicism would be no more wonderful than the appreciation of Elizabethan romanticism which was a mark of the last century.

The comedy of the latter part of the seventeenth century is one phase of this neo-classical movement that it is yet the fashion to condemn. Many school histories continue to treat with silence all of the period so far as the dramatists are concerned, others content themselves with a brief mention of three or four important names, while many of the more serious books have nothing but a sweeping denunciation. It is to be hoped that some competent and sympathetic critic may in time enter the field, for the drama in England from 1660 to the present has received no attention proportionate to its interest and value, and within this field the comedy most repays study.

The comedy of manners of the later seventeenth century is a direct development of the comedy of "humours" of the early seventeenth century, influenced by French classical comedy and the Spanish comedy of intrigue. The tradition of Jonson is seen particularly in Shadwell, while the Beaumont and Fletcher comedy likewise appears in a very large portion of the dramatic writers. In this later manifestation the emphasis is transferred from human nature to dress and manners, though the characters of course continue to be the embodiment of a single trait. On the other hand, in the attempt to carry out the French interpretation of Aristotle, and in the polish and emphasis of the qualities of style and dialogue, the comedy owes much to Molière and his school.

Several distinct stages may be distinguished. First there is the period of development in which the Jonsonian type is represented by Shadwell and the French type by Etherege, of the latter of whom Gosse says that he "virtually founded English comedy, as it was successively understood by Congreve, Goldsmith and Sheridan." Shadwell is a lesser—much lesser—Jonson. He resembles his master in his portrayal of extravagance of character, in the lack of plot unity, and in the same general method of having two sets of characters, characterized by Miss Woodbridge as the dupers and the duped. But he is interesting chiefly as showing the persistence of the Jonsonian technique into this period.

The height is reached in Dryden, Wycherly, Congreve, Vanbrugh and Farquhar, who are the only writers known to the general reader. Dryden, while not original in his plots, is not worthy the almost universal condemnation he receives from the critics. In Wycherly there is true satire, satire almost Swiftian in its intensity. Congreve reaches the highest perfection. His style is almost perfect, his wit is supreme in English literature within its field, though as George Meredith says, "A plot was an after-thought with Congreve." The delicacy and fineness of his points make him a library rather than a stage dramatist. It is to Congreve that Lamb's defense particularly applies, and with respect to Congreve one is inclined to admit that the plea is valid. But in Vanbrugh we begin to leave this Utopian fairyland, for Vanbrugh is an observer, not a poet. In Farquhar the moral standard appears still more, and love ceases to be mere sensuality.

The transition to Sheridan and Goldsmith is represented by Cibber and Steele. In this sentimental comedy we find a moral attached to each play, often a rather maudlin moral, appearing after four acts which are not much higher ethically than those of Vanbrugh or Wycherly. This change may be illustrated by a comparison of this from Etherege: "Your nephew ought to conceal it (his marriage) for a time, Madam, since marriage has lost its good name; prudent men seldom expose their own reputations till 'tis convenient to justify their wives," with Steele's sentiment that "wedlock is hell if at least one side does not love as it would be heaven if both did." But this lachrymose comedy led to the taking wit and the kindly attitude of Sheridan and Goldsmith, in which we again find ourselves in the world of reality, without the four acts among the "chaotic" people.

The attitude of writers toward the morality of the comedies is interesting. Lamb's defense in his essay, "On the artificial comedy of the last century," is the classic:

> "We have been spoiled with . . . the . . . drama of common life; where the moral point is everything; where, instead of the fictitious half-believed personages of the stage, (the phantoms of old comedy,) we recognize ourselves, our brothers, aunts, kinsfolk, allies, patrons, enemies—the same as in life . . .
>
> " . . . I do not know how it is with others, but I feel the better always from the perusal of one of Congreve's—nay, why should I not add even of Wycherly's—comedies. I am the gayer at least for it; and I could never connect those sports of a witty fancy in any shape with any result to be drawn from them to imitation in real life. They are a world of themselves almost as much as fairyland. . . . But in its own world do we feel the creature is so very bad? The Fainalls and the Mirabels, the Dorimants and the Lady Tonchwoods, in their own sphere, do not offend my moral sense; in fact they do not appeal to it at all. They seem engaged in their proper element. They break

through no laws, or conscientious restraints. They know of none. They have got out of Christendom into the land—what shall we call it?—of cuckoldry—the Utopia of gallantry where pleasure is duty, and the manners perfect freedom. It is altogether a speculative scene of things, which has no relation whatever to the world that is. . . . He (Congreve) has spread a privation of moral light . . . over his creatures; and his shadows flit before you without distinction or preference. Had he introduced a good character, a single gush of moral feeling, a revulsion of the judgment to actual life and actual duties, the impertinent Goshen would have only lighted to the discovery of deformities, which now are none, because we think them none.

" . . . When we are among them (the characters of Congreve and Wycherly), we are amongst a chaotic people. We are not to judge them by our usages. No reverend institutions are insulted by their proceedings, for they have none among them. No peace of families is violated, for no family ties exist among them. No purity of the marriage bed is stained, for none is supposed to have a being. . . . There is neither right nor wrong, gratitude or its opposite, claim or duty, paternity or sonship. . . .

"The whole is a passing pageant. . . . But, like Don Quixote, we take part against the puppets, and quite as impertinently. . . . we would indict our very dreams."

This was replied to by Macauley in his review of Leigh Hunt's edition of the Dramatic Works of Wychery, Congreve, Vanbrugh and Farquhar:

"In the name of art, as well as in the name of virtue, we protest against the principle that the world of pure comedy is one into which no moral enters. If comedy be an imitation, under whatever conventions, of real life, how is it possible that it can have no reference to the great rule which directs life, and to feelings which are called forth by every incident of life? If what Mr. Charles Lamb says were correct, the inference would be that these dramatists did not in the least understand the very first principles of their craft. Pure landscape-painting into which no light or shade enters, pure portrait-painting into which no expression enters, are phrases less at variance with sound criticism than pure comedy in which no moral enters.

" But it is not the fact that the world of these dramatists is a world into which no moral enters. . . . The heroes and heroines, too, have a moral code of their own, an exceedingly bad one. . . . It is . . . a code actually received and obeyed by great numbers of people. We need not go to Utopia or Fairyland to find them. They are near at hand. Every night some of them cheat at the hells in the Quadrant, and others pace the Piazza in Covent Garden. . . . The morality of the Country Wife and the Old Bachelor is the morality, not, as Mr. Charles Lamb maintains, of an unreal world, but of a world which is a great deal too real. It is the morality, not of a chaotic people, but of low town-rakes, and of those ladies whom the newspapers call 'dashing Cyprians.' And the question is simply this, whether a man of genius who constantly and systematically endeavors to make this sort of character attractive, by uniting it with beauty, grace, dignity, spirit, a high social position, popularity, literature, wit, taste, knowledge of the world, brilliant success in every undertaking, does or does not make an ill use of his powers. We own that we are unable to understand how this question can be answered in any way but one."

Street, the most recent defender, in his introduction to the comedies of Congreve, argues that comedy is satiric, that as satire it has to deal with the vices and foibles of society, that if it were to treat of love and the conventions of society it would be forced to satirise them, and hence they have no place in satiric comedy. He defends the fact that vice and folly are crowded into the plays on the ground that as art they should give a picture, not be photographic.

It may be interesting to hear the dramatists themselves on the subject. Shadwell in the preface to the Sullen Lovers expresses himself not without vigor:

> "But in the plays, which have been wrote of late, there is no such thing as perfect character, but the two chief persons are most commonly a swearing, drinking, whoring, ruffian for a lover, and an impudent ill-bred tomrig for a mistress, and these are the fine people of the play, and . . . almost anything is proper for them to say; but their chief subject is bawdry, and profaneness, which they call brisk writing, when the most dissolute of men, that relish those things well enough in private, are shocked at them in public. And methinks, if there were nothing but the ill manners of it, it should make poets avoid that indecent way of writing."

And Congreve, in the dedicatory letter prefixed to the Double Dealer, defends himself as follows:

> "But there is one thing at which I am more concerned than at all the false criticisms that are made upon me; and that is some of the ladies are offended. I am heartily sorry for it, for I declare I would rather disoblige all the critics in the world than one of the fair sex. They are concerned that I represented some women vicious and affected: how can I help it? It is the business of a comic poet to paint the vices and follies of humankind; and there are but two sexes, male and female, men and women, which have a title to humanity; and if I leave one-half of them out, the work will be imperfect. I should be very glad of an opportunity to make my compliment to those ladies who are offended; but they can no more expect it in a comedy, than to be tickled by a surgeon when he is letting 'em blood."

One would rather avoid committing himself to immorality or unmorality. But, taking either, how many of us do not have interesting and entertaining friends whose code of action is not our own, yet whose society we continue to cultivate, extracting not a little pleasure from it.

Confining ourselves to these better known writers before 1700, a few general statements may be formulated in regard to their method.

In the subject that they treat they confine themselves to a limited section of but a part of the people. They reflect the park, the court, the street, the exchange, and even here they keep on the surface, dealing with such selected evils as dress, manners, speech. A love intrigue is commonly the central motive, but often overtopping it in interest is the clever dialogue in which many things are satirized. The attitude is one of satire and raillery against all established institutions; against marriage, the manners of society, the Puritans, the newly developing sciences, the Court. Duelling, the country and its inhabitants, the opera, the new songs and novels, the affectation of foreign airs, the adoption of foreign words, poetry and dilletante writing, polite literary conversation, legal abuses, and almost every other subject that can occur to one are made subjects for biting comment by the wits and would-be wits in the plays.

In plot construction these writers are deficient, but while they were not able to manage the sustained elements of plot, in their separate situations the greatest skill is shown, and in the actual presentation these incidents should be most lively and interesting. The chief fault lies in too great intricacy or over elaborateness. Then, too, the plots are very often the elaboration of a stock theme, the most prevalent being the struggle on the part of a very brilliant young man to discard a mistress, who objects to being discarded, that he may ally himself with a virtuous young woman. The play ends in the discomfiture of the cast-off mistress, and the marriage with the virtuous young woman, for despite his art, she will have him on no other terms. Allied to the main action are so many minor actions that it sometimes becomes difficult to keep the threads separate.

Quite closely allied to the main action is the affair between the servant of the hero and the maids of the women with whom the hero has to do. As often as the hero transfers his affections, so often does his servant, and for no other apparent reason. It may be added that the maids are always extremely mercenary and on the side of the intriguers.

The characterization is extremely vague and conventional. The heroes are all witty, wealthy, popular, while their life work is the pursuit of women. The heroines are all witty, beautiful, and while they do not hesitate to discuss matters not now generally discussed, are virtuous in action. The hero of almost any of the plays might be the hero of any other so far as any distinct qualities he may have, and it is likewise with the heroines.

But outside the small numbers of what may be called in modern stage terminology "straight" parts, are the quite large numbers of character parts, which become conventional types as the comedy reaches its height. Almost every play has its pretended wit; a fool who apes the men of sense and fashion, who thinks himself most clever, and who is perfectly oblivious to the fact that he is being made the butt of the few sensible characters. These are the Dapperwits, the Witwouds and the Tattles. Closely allied to this class is the fop who apes the French, thinks only of his dress, his appearance, the figure he makes. He is ostentatious in all he does, is single-minded, but is really not such an awful fool as one imagines the first time he meets him. In Etherege's Sir Fopling Flutter, and in Cibber's Sir Novelty Fashion—the Lord Foppington of Vanbrugh's Relapse—we have two master presentations of this character. Another ineresting type is the Miss Hoyden-Prue-Hippolyta young woman, who has been kept in secluded ignorance of the world, but who shows a sudden ingenuity, knowledge of the world, and unexpected desire for the sensual joys of life. There are, of course, the elderly cuckolds, dominated and fooled by their wives, and the wives who protest virtue but do not practice it. But these, while prominent types in this period, are almost as prevalent in the comedy that precedes. In general the characters show a tendency to exaggeration, are a development of the drawing of "humours" of Jonson, with the same use of descriptive names—Courtall, Mrs. Frail, Lady Wishfort, Justice Clodpate—to save the labor of characterization, and are lacking in complexity and in development.

The most of the plays are set in London, in localities familiar to the audiences. Within the class and localities to which the comedy restricts itself, it is a most interesting and valuable social document, but it must always be remembered that it is in no sense representative of the whole people. Sometimes we are taken to Spain or Italy, but it is Spain or Italy only in name, the people and the customs are all English. We may sometimes be taken to the fashionable watering places in England, but we are never taken to the despised country.

Of the many conventions contrary to ordinary human life which were so common to the Elizabethan drama, only asides and disguises have come down to this period, and of these the use of asides, which are heard by everyone but him whom they concern, has come down to our own day. It is in the exquisitely polished prose style and the epigrammatic dialogue that the comedy excels. The style is brilliant and the main source of interest in the plays is the intensely satirical wit and repartee.

There is nothing finer of its kind in English literature than the dialogue in Congreve's Love for Love. While we may wish at times that the fine ladies might show more delicacy in the topics they select for conversation, it is not a vulgar indelicacy, and the wit certainly pays subtle compliment to our intelligence, for it is no slight intellectual feat to follow at all times the brilliance and fineness and quickness, if not the depth, of the conversation.

Whatever else we may say of restoration comedy, it is certainly amusing. While its morals may not be all one might wish, and while its plots may lack coherence and probability, and while its characters may show a tendency to degenerate into fixed types, yet it is interesting and readable for its finish of style and brilliance of wit. And even though its plots and characters may not reach the ideal of an absolute artistic standard, they are second only to those of the greatest masters in the English drama.

ABSTRACTS OF THESES.

I. THE DEVELOPMENT OF THE REFORMATION-IDEA IN THE HISTORY OF GERMAN LITERATURE.[1]

BY GEORGE BRODTHAGE, PH.D., *Pastor.*

Reformation in the true sense signifies a returning to pure ideals of simplified truth, and reforming life and doctrine upon them. Reformation means correction and regeneration according to the simple and primitive standards. By "Reformation" we understand more than mere religious improvement. It means the regeneration of the German nation and the proclamation of independence in the spiritual, scientific and social life.

Liberation from scholastic tradition and from mediaeval class-prejudices, the rejection of the ecclesiastical authority in spiritual and scientific matters, as well as the rejection of the assumed prerogatives of kingly sovereignty, grew out of different views of the world based upon different national characteristics.

The restoration in the Lutheran reformation is only a part, though the main part, of the re-establishment of the German heroic spirit. In the Middle Ages all conditions of life were determined by religion; hence the threefold fight for liberty was centered in the Church.

The liberation of the German national life does not begin with the so-called Lutheran reformation. The first blow was dealt by science. The German reformation begins with the restoration of freedom in science by the Humanists. The reformation antedates Martin Luther, since it began with Erasmus.

The reformation broadly considered affected not only the Church and doctrine but reached all conditions of life, even though those who participated, may not have seen how much was involved.

The Lutheran reformation turns away from the scholastic-traditional adoration of the saints and turns back to the Christian Wodan whom in the "Wessobrunner Prayer" we learned to worship as the source of all good and of true knowledge. The German characteristic trait of the "spirituality of the worship of God" is restored. In science the German trait of "freedom of thought" and "speculative investigation of the intellect" comes to its own. All the German institutions and conditions of life had been at stake and must be regenerated.

This re-establishment of the German heroic spirit is accomplished in a series of reformations or revolutions (according to the standpoint of the student). After the scientific reformation followed the religious reformation; then the civil, involving equality of classes, the revolution of the knights under Sickingen and Hutten and the revolution of the peasants which, by the introduction of the "Roman law" in the 15th century, had been given over to serfdom. The two latter movements were premature. We recognize that the revolution of the peasants was not directed against ecclesiastical arrogance; that here as in the "Minne-service" of Thomasin the corruption was not the fault of the Church, but of the secular authorities; for the Church from the beginning opposed serfdom.

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[1] Abstract of Part IV of a thesis submitted, May, 1907, to the Faculty of Graduate Studies of The George Washington University in part satisfaction of the requirements for the degree of Doctor of Philosophy.

1. *The Importance of Martin Luther.*—(a) Luther led the German nation back to the true fountain of all good and knowledge.

(b) Therefore Luther is the prophet of the reformation, just as in a special sense the champions of Humanism (especially Erasmus) are prophets of free science. Luther is the prophet also of free science, for he saved free science for the religious reformation by establishing the vacillating Melanchthon.

(c) In Luther we reach the highest point in the spiritualization of the German character. We have followed the curve of the spiritualization of the German characteristics. First Thomasin had pointed out the falsity of the novels, and out of this knowledge grew the later uneasiness of the secular writers. Writers turn to spiritual subjects which they bring in opposition to worldly poetry. From the spiritual the curve passes over to the visionary, supersensible and (at the same time) coarsely-sensual in mysticism. Then all nature is spiritualized, allegorized, even popular poems. At the same time penitential zeal is awakened (the most touching seen in St. Elizabeth), while the superficiality of the Catholic doctrine of the forgiveness of sins furthers the cult of St. Mary and the saints. All this error and corruption is reformed by Luther on the basis of the Germanic character.

(d) The Lutheran reformation means the spiritual regeneration of the German.

(e) Luther's translation of the Bible has political-reformatory influence, and wrought for the union of the German tribes. By it Germany was preserved from being separated into two halves relating to language.

(f) His translation was a popular work. The great German poets (Klopstock, Herder, Goethe, Schiller) have drawn a great part of their riches as well as of their power of speech out of Luther's model work.

(g) The reformation is the declaration of independence of the German spirit which had then attained manhood.

(h) The Lutheran reformation is not the reforming of the Roman-Catholic Church, but it is the founding of the German-Christian Church based upon the German national character.

2. *The Significance of the Lutheran Reformation in the Development*

limited number of coincidences are ascribed to chance, while a larger number of coincidences are not but may be affirmed as due to design.

The main question that is discussed in this chapter is, however, the question in regard to the demonstration of the existence of teleology on empirical grounds alone. The conclusion here reached is that such a demonstration is impossible. This conclusion does not deny the existence of teleological principles, but that some other method or way is necessary to make certain the existence of this principle than the mere accumulation of evidence obtained from an examination of phenomena, empirically. The contention here is that the empirical consideration of supposedly purposive phenomena will only yield a probability of such phenomena being due to teleologically acting causes inasmuch as there always remains from an empirical standpoint of this kind a certain element of uncertainty, i. e., there always remains a possibility that any given phenomenon may have been occasioned by other causes. It is not denied, however, that the probability of such an happening may indefinitely recede but as long as the possibility of such an happening being due to other than final causes there must always remain a certain degree of uncertainty and consequently a lack of complete demonstration. The existence of such a principle as finality would, on this ground alone always remain more or less of an open question. That the probability of the definite existence of this category would be so great as to compel universal acceptance may be doubted as the history of the past clearly shows. Numerous instances are not wanting where certain phenomena that have been cited in support of the presence, in nature, of finality have been later shown to be capable of explanation by mechanically acting causes alone. This position taken in this chapter is thus at variance with that of Prof. Janet, as evidenced in his book on Final Causes. An examination of "order" is also made in this connection as to whether any advance is made towards teleology in this way as has been maintained.

The concluding chapter deals with the subject matter of this thesis epistemologically and ontelogically. A preliminary reference is made to an unconscious bias frequently manifested in regard to various philosophic movements. The question is raised as to whether it is necessary for us either to accept one and reject the other of the two principles under consideration, i. e., are they mutually exclusive. Also, the question if one or the other or both are accepted as true what is the limitation of each?

A discussion follows at some length as to what the so-called laws of nature really are. Whether these are to be considered as does Prof. Pearson, for instance, merely as "shorthand" descriptions of perceptual experience or whether they have an objective validity and force independent of the percipient, as well as modified views in regard to the same.

Natural science as regards its aim and scope is considered and exception is taken to that view of natural science which sees in it nothing but an aim to understand nature for the purpose of interference in the course of events for practical purposes. A distinction is made, between science as knowledge and applied science—a distinction that is apparently forgotten by those who see only the latter.

A discussion of the Kantian position as regards mechanism and teleology occupies a considerable part of the concluding portion of this thesis. The contention of Kant that teleology is only regulative rather than constitutive, as is mechanism, is criticized. The question of the mutual exclusiveness of these two categories as regards each other—that they are in reality incompatible as is affirmed by Kant—is here denied. The conclusions reached are that purposiveness is a necessary principle which is an intrinsic part of the constitution of the universe—that belongs to its very nature and is not something supplied from without by the cognitive faculty of a perceiving subject. Teleology is not imposed upon things simply in order that a gap in our apprehension or knowledge of these things may be bridged over. Herein is a deficiency in the Kantian philosophy which regards it as a kind of makeshift, *a dernier ressort* to be brought in where other principles have failed. The inadequacy of mechanism as regards universality and ultimateness, is not due to a limitation of our human faculties, but this inadequacy lies in the very nature of the concept itself. The category of mechanism becomes exhausted before it can afford a complete explanation of things and a new and higher principle becomes necessary. This new principle is a truer one than that which it has superseded. The supersession that is accomplished here is in the sense of the German word *aufheben*. To disparage one of these two principles to the enhancement of the other is unnecessary and unjustifiable, although they do not stand on an equality when considered in relation to reality. To conceive nature only under the form of mechanism gives only a partial comprehension of nature. Likewise to conceive nature as only the concept of teleology is to place purpose and end where it does not belong and to make in some cases ridiculous applications. Considered from the view-point of a historical genius of the knowledge of reality one of these principles has the same worth and significance as the other. It is the *union* of the two, which Kant has declared not to be " rationally comprehensible," that makes possible an understanding of nature. Neither the one or the other is sufficient alone for this comprehension. This does not mean, however, that we are compelled to subscribe to some of the rather over-stated positions that, for instance, mechanism cannot be held ever in its most meager outlines or simplest formulations without there being at the same time a teleology connected therewith. Mechanism is not teleology, neither is teleology mechanism.

III. THE SIMULTANEOUS MEASUREMENT OF THE CAPACITY AND POWER FACTOR OF CONDENSERS.[1]

BY FREDERICK W. GROVER, PH.D.

In a condenser having absorption, the angle of advance between the current and the electromotive force is less than 90° by a small angle θ, the power factor being equal to $\sin\theta$. A condenser having absorption is equivalent, therefore, in its effect on the phase of the current, to a capacity in series with a small resistance r of such a value that $\tan\theta = pCr$ (where $p = 2\pi$ times the frequency) or to a capacity in parallel with a large resistance R such that $\tan\theta = \frac{1}{pCr}$.

The power factor of a condenser is more acurately measured by determining this small angle θ than by direct measurement of the energy loss itself. Such measurements of the phase difference have been made by Potts[2] using one of Rowland's electrodynamometer methods, and by Rosa,[3] who has developed a number of dynamometer methods, and shown that they give results in good agreement with one another, and with his results on the same condensers by a calorimetric method.[4]

In 1891 Max Wien[5] gave several alternating current bridge methods for the measurement of inductances and capacities. Among these is one where the absorption of the condenser to be tested, which he represented by a resistance in parallel with a capacity, is compensated for by an adjustable resistance in series with the standard capacity. The absorption of the latter is assumed to be zero. An elaborate investigation of the energy losses in the dielectric of cables has been published, since the work in this paper was begun, by Monach[6] in which Wien's method was successfully used.

The following three bridge methods have been found satisfactory. In the first three, each side of the bridge consists as usual of a capacity in series with one of the ratio coils. The phases of the currents in the two sides of the bridge are brought into unison:

1. By an adjustable resistance in series with the standard condenser.

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[1] Abstract of a thesis submitted May, 1907, to the Faculty of Graduate Studies of The George Washington University, in part satisfaction of the requirements of the degree of Doctor of Philosophy.

[2] Amer. Jour. Sci. (4), 10, p. 91, 1900. Phys. Zs., 2, p. 301, 1901.

[3] Bulletin of Bureau of Standards, 1, p. 383, 1905.

[4] Rosa, Phys. Rev., Feb., 1899.

[5] Wied. Annalen, 44, p. 681, 1891.

[6] Inaugural Dissertation, Dantzig, 1906.

2. By an adjustable resistance in parallel with the standard condenser.
3. By a variable inductance in series with that ratio arm which is adjacent to the condenser to be tested.

Method I.—This is the same in principle as that of Wien, described above, except that, whereas he derived the formula on the assumption that the resistance representing the absorption was in parallel with the condenser, the author has adopted the assumption that it is in series with the condenser. The expression is, in this case, simpler, more symmetrical, and allows its physical significance to be more readily seen. Physically, it is, of course, immaterial which assumption is adopted since we are only concerned with the change in the phase of the current due to the presence of the absorption.

It is more convenient in practice to introduce a series resistance ρ into each condenser arm. Then

$$\frac{C_1}{C_2} = \frac{R_2}{R_1}$$

$$\tan(\theta_1 - \theta_2) = pC_2\rho_2 - pC_1\rho_1$$

Method II.—To avoid the necessity of working with resistances of several megohms it is best to put a resistance ρ in parallel with each of the condensers. Then

$$\frac{C_1}{C_2} = \frac{R_2}{R_1}$$

$$\tan(\theta_1 - \theta_2) = \frac{1}{pC_2\rho_2} - \frac{1}{pC_1\rho_1}$$

This method is not so good as the other two, since the sensible electrostatic capacities, inseparable from such large resistances, must be added to the capacities of the condensers. The power factor measurement is not, however, affected by these capacities.

Method III.—In practice a fixed industance L_2 is inserted in one arm and a variable inductance L_1 in the other. Then

$$\frac{C_2}{C_1} = \frac{R_1}{R_2}$$

$$\tan(\theta_1 - \theta_2) = \frac{pL_1}{R_1} - \frac{pL_2}{R_2}$$

This method has the advantage that nothing is placed in the arms with the condensers. It is, therefore, especially adapted to the comparison of capacities as small as 0.001 mf, where in Method I the errors due to capacity of the large resistances r, required with such small capacities, may become appreciable.

To obtain the most precise results with these three methods, the condensers should be nearly equal in capacity and power factor, and it is best to balance each of the two capacities against that of a third auxiliary condenser. This procedure has the following advantages:

1. Errors due to electrostatic induction between the bridge and its surroundings are practically eliminated.

2. The ratio of the two capacities is proportional to the two nearly equal settings of the same resistance box, making an accurate determination of the actual values of the coils unnecessary.

The following method has been found satisfactory and is especially valuable as a check on those already given, since it is very different in principle.

Method IV.—It has been shown[7] that in the comparison of an inductance with a capacity by Anderson's method, the effect of the absorption of the condenser on the value of the inductance obtained is in all ordinary cases extremely small. The difference in the actual value of the resistance Q' of the arm containing the inductance from the value Q with direct current, due to the absorption of the condenser may become very appreciable.

$$Q' = Q + pL \tan\theta$$

$$\tan\theta = \frac{Q' - Q}{pL} \qquad (A)$$

If settings be made with first one condenser, and then with the other

$$\tan(\theta_1 - \theta_2) = \frac{\Delta Q'}{pL}$$

where $\Delta Q'$ is the difference between the values of Q' in the two cases, and

$$\frac{C_1}{C_2} = \frac{2r_2 + P}{2r_1 + P}$$

if the ratio arms P and R are equal.

This in inherently a substitution method, and by properly choosing L so as to give a satisfactorily large value to ΔQ, good results have been obtained.

The absolute values of the power factor of a condenser follows at once from measurements with these methods, if some standard of reference is at hand. For capacities of 0.1 mf and smaller, comparisons were made directly with air condensers of negligible leakage. The values for the larger capacities were obtained by stepping up from 0.1 mf, using the relation that the resultant power factor f of two condensers of capacities C_1 and C_2 and of power factors f_1 and f_2 is given by

$$f = \frac{C_1 f_1 + C_2 f_2}{C_1 + C_2}$$

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[7] Rosa and Grover, G. W. U. Bulletin, vol. 1, p. 312, 1905.

As a check on this process, the power factor of a 1 mf condenser was determined by using formula (A) of Method IV, the observed value (Q'—Q) being corrected for the effect of the known residual inductances and capacities of the arms of the bridge. The result agreed closely with that given by stepping up from the 0.1 mf air condenser. Care must be taken in using formula (A) that the change in resistance of the coil L with the frequency is negligible, otherwise it must be determined and allowed for.

RESULTS.

These four methods have been tested by measurements on a large number of condensers, at frequencies between 30 and 1000 cycles (using vibration galvanometers to balance the bridge). The capacity ratios obtained by the different methods agree to a few parts in 100,000, while the differences $(\theta_1 - \theta_2)$ do not differ more than can be explained by the errors in the setting of the bridge. It has been found

1. For good mica condensers the angle θ may be as small as 0′ 30″ and as large as 4′. Poorer mica condensers, especially if their capacity is small may give values of θ as large as 30′ or even more.
2. Good condensers with paraffined paper for a dielectric have a value of from 5′ to 20′; for poor telephone condensers angles as large as 10° have been observed!
3. For all the mica condensers examined the angle θ diminishes slowly as the frequency rises.
4. The same result was observed with all the poorer paper condensers, but with some of the better paper condensers the effect was in the opposite direction. The changes are all greater than in the case of mica condensers.
5. Above 20° the power factor increases with rise of temperature both in mica and in paper condensers, the effect being small for the former and very large for some of the poorer paper condensers.

Since the power factor depends primarily on the absorption, the leakage having but a small effect the value of the power factor would be expected to give a relative indication of the magnitude of those effects which depend on absorption, viz.: residual charges, change of capacity with the frequency, dependence of the apparent capacity on the time of charge and discharge, etc. Ballistic measurements show that this hypothesis is substantiated qualitatively and, approximately, quantitatively. A measurement of the power factor gives, therefore, valuable information as to the quality of the condenser.

These effects of changes of frequency and temperature are being more thoroughly investigated.

In Memoriam.

JAMES CARROLL, M. D.

JUNE 5, 1854.
SEPTEMBER 16, 1907.

BY PROFESSOR CHARLES E. MUNROE,
Dean of the Faculty of Graduate Studies.

The death of James Carroll, M.D., Surgeon and Major U. S. Army, on September 16, 1907, inflicted a very serious loss upon The George Washington University, and brought sorrow to the hearts of his many associates in the faculties of that institution, with which he had maintained an active connection for some twelve years.

He was appointed a Demonstrator in the Medical School of the George Washington (then Columbian) University in 1895 under the supervision of Dr. Walter Reed, Surgeon U. S. Army, who was then, and for many years, Professor of Pathology and Bacteriology in this Medical School. In 1902, Dr. Carroll was promoted to Associate Professor of Bacteriology and Pathology, and appointed to succeed Professor Reed, as Pathologist to the University Hospital. In 1905, he was promoted to a full professorship in the Department of Medicine, and also given supervision over the students pursuing researches in Bacteriology under the direction of the Faculty of Graduate Studies.

Professor Carroll's connection with the University included the period during which the University Hospital was created and set in operation, and the new Medical School building, which is well adapted to its intended purposes, was built. Dr. De Schweinitz, Dean of the Medical School, relied much upon the judgment, special knowledge and experience of Dr. Carroll in planning the building; and the excellent bacteriological laboratory with which the Department of Medicine is now provided, was largely due to Dr. Carroll's advice and active supervision.

Throughout his connection with the Department of Medicine, Dr. Carroll was a most devoted and assiduous teacher. Kindly in spirit, tolerant in views, in sympathy with youth, lucid in exposition, earnest in manner, a master of his subject and skilled in its technique, he commanded the respect and esteem of his students and compelled, by force of character and restrained enthusiasm, an interest in the subject taught.

When Dr. Carroll became connected with the Medical School the entire course of instruction in this, as in all other professional schools in Washington, was given after office hours, and late into the evening, in order to accommodate, not only the many students who were employed in the various departments of the United States Government, but also the eminent specialists who were willing to assist in the promotion of medical education. During his connection owing to criticism on this method of procedure, the entire plan has been changed, a growing nucleus of professors giving their whole time to the conduct of the school has been formed with practitioners and specialists grouped about them, the instruction is begun in the early forenoon and continued throughout the day and the plan made to conform to the most approved examples. Throughout this work of reorganization, Dr. Carroll gave able assistance and so adapted the work in his topic and selected his assistants with such excellent judgment that the students continued to benefit by his talents and knowledge, and to be subject to his beneficent influence.

In faculty meetings, as in his teachings and his scientific work, he held to strict standards and high ideals, but while expressing his views with definiteness and maintaining his position with firmness, he manifested a willingness to listen and to be convinced. He differed from his associates without acrimony and accepted an adverse decision without cherishing resentment. In fact, his entire relations were characterized by a determined gentleness and thoughtful consideration.

Dr. Carroll was without doubt ambitious; but his ambition consisted in the indestructible desire to do well everything that he was called upon to do. Whatever work he was engaged upon, no matter what might be its extent or importance, he could never be content with doing less than his best. The same lofty purpose and the same careful judgment were applied to all he did, in small things as in great things. No man of his high character and just discernment could be free from likes and dislikes; but no man ever took more care to avoid injuring by word or deed those who failed to win his esteem or regard. Free from malice and prejudice; calm and dispassionate in judgment; even in temper; kindly and amiable in manner he kept on good terms with those about him. But the trait in his character which perhaps most forcibly impressed those who came in contact with him was his absolute straightforwardness and reliability. He was utterly without subterfuge or reservation. He was a man whom you felt implicit confidence in. There was therefore no man in the faculties who commanded more universal respect and regard than James Carroll; and none have died more universally regretted.

BRIEF MENTION.

Messrs. G. P. Putnam's Sons have recently published a Text Book on Plain and Spherical Trigonometry, by Professor J. Howard Gore, head of the mathematical department of the University.

Although issued but a few weeks ago, the first edition has already been exhausted.

In May Dr. George P. Merrill, Professor of Geology and Mineralogy, was sent by the Smithsonian Institution to study the remarkable crater-like depression near Cañon Diablo, in Arizona, and incidentally, visited the Grand Cañon of the Colorado and the fossil forest. His report on the origin of the crater is now in course of preparation. Incidental to this he has published two brief papers, one relative to a peculiar phase of metamorphism in the siliceous sandstone found in the crater, and the other bearing upon the nature and origin of the meteoric irons for which the locality is noted.

In a volume on the "Mineral Resources of Virginia" prepared as a memoir of the Jamestown Exposition, and just issued by the Virginia Geological Survey, Dr. R. S. Bassler, Assistant Professor of Geology, has an extended article on the geology and stratigraphy, and the non-metallic minerals of the State. Professor Bassler has spent his summers during the past four years in a detailed study of the complicated stratigraphy of Appalachian Virginia, and the results of this work are given in this volume. All the minerals of any economic importance are touched upon and numerous cuts and structure sections illustrating the occurrence and genesis of the more important materials are included.

"The Essentials of Aesthetics," by Dr. G. L. Raymond, Professor of Aesthetics, contains the course of lectures delivered in The George Washington University, for the first and only time in 1905-06. The book was published last spring by G. P. Putnam's Sons of New York, and John Murray of London. We take these notices of it from Putnam's Monthly.

Its superior in an effective all-round discussion of its subject is not in sight.—*The Outlook.*

So lucid in expression and rich in illustration that every page contains matter of deep interest even to the general reader.—*Boston Herald.*

It can hardly fail to make talent more rational, genius more conscious of the principles of art, and the critic and connoisseur better equipped for impression, judgment or appraisement.—*N. Y. Times.*

In spite of all that has been written on the subject from widely contrasted standpoints, this manual has distinct claims on students.—*The Standard* (London).

His evidence is clear and straigtforward, and his conclusions eminently scholarly and sound.—*Vanity Fair* (London).

Dr. Raymond's book will be invaluable. He shows a knowledge both extensive and exact of the various fine arts and accompanies his ingenious and suggestive theories by copious illustrations.—*The Scotsman* (Edinburgh).

Professor Raymond has another book in press, "The Psychology of Inspiration," to be published in January, 1908, by the Funk and Wagnalls Company.

The work of Brigadier General Henry L. Abbot, Professor of Hydraulic Engineering, on the "Problems of the Panama Canal," (The Macmillan Company, 1907) has attracted considerable attention and a second edition was published a few months ago. The *Scientific American,* August 24, 1907, speaks of it as follows: "Brigadier General Henry L. Abbot, who was for seven years connected with the work in question, has written of the problems of the canal in a manner that deserves the highest commendation. His book is a minute and painstaking description of every detail of the great labor, with full tables of statistics in every department of the work, yet so remarkably is the subject matter composed that the interest to the casual reader is not destroyed. The engineer in search of exact information, and the laymen wishing for general information will both find it equally interesting."

Similarly the *Engineering News,* May 16, 1907, says: "The first edition of this book appeared about two years ago before the final determination was made of the type of construction. In the present edition, General Abbot brings the work up to the beginning of 1907 by the addition of a chapter dealing with the history of the work since the United States assumed control in 1904."

General Abbot has now on hand, a paper on the "Present Status of the Panama Project," prepared at the request of Professor Emory R. Johnson, Editor of the Annals of the American Academy of Political Science, to form part of a volume on "The Use and Development of American Waterways," to be published by the Academy next January.

Professor Hermann Schoenfeld, head of the Department of German, has been granted a year's leave of absence by the University, which he will spend partly on a diplomatic mission in Germany, Austria, and the Orient, in connection with the establishment of the Turkish Embassy at Washington. While in these countries he will put the finishing touches to a scientific work on which he has been engaged for fourteen years, namely, the investigation of the Slavonic elements in East German civilization, history and literature. Professor Schoenfeld has formulated the substance of this investigation in an earlier work on Higher Education in Russia, Austria, and Prussian Poland, United States Bureau of Education, Government Printing Office, 1896, pp. 715, 716, in the following words:

"Indeed the colonization by the German element of all that land is nothing but a protracted struggle, beginning as early as Charlemagne's time and not finished yet by far, to subject, to absorb, or to annihilate the Slavonic, principally Polish, population that has expanded over the territory vacated by the German tribes during the first migration of peoples. For Leopold von Ranke's statement: 'Es sind zwei Völkerwanderungen, durch die der Umkreis der deutschen Gebiete aus dem inneren Germanien her bestimmt worden: die eine war nach dem Westen, die andere nach dem Osten gerichet,' is absolutely correct. But while the Germanic tribes had pushed themselves forward toward the West and South in powerful streams and in a comparatively short period of time, the backward flood toward the East against the natural course of Slavonic immigration occurred slowly, gradually through many centuries, often interrupted by long pauses, historically not determined. While during the first migration Teutonic pagans pushed beyond the boundaries of Germania, it was Catholic Christianity, the victorious Roman Church, the monks, who accompanied the progress of the Germans; later on it was the Reformation which led thousands and thousands toward the East. It is, of course, not to be forgotten that a second main incentive was the craving for material wealth and wordly power which made such invasions very bloody, cruel and unjust, full of epic battles and adventures so graphically described in Mickiewicz's Konrad Wallenrod, concerning the struggle between the Lithuanians and the Teutonic knights."

An editorial in the *Oil Paint and Drug Reporter,* March 11, 1907, Vol. LXXI, No. 10, page 7, contains a brief synopsis of Professor Munroe's census report on the petroleum industry, from which we quote as follows:

"The present issue of the *Reporter* contains the quinquennial census of the petroleum industry of the United States, compiled by Dr. Charles E. Munroe, Professor of Chemistry in The George Washington University. It is one of the most exhaustive reports probably ever issued upon the same subject and will be read with interest by all trades dependent directly or indirectly upon petroleum. The compiler of the statistics not only goes into minute figures in a series of comparative tables covering a period of twenty-five years immediately antedating 1905, but he takes particular pains to show the cost and growing importance of the industry owing to the extraordinary increase in the number of uses to which petroleum is now applied in different stages of its distillation.

"Beginning with the manufacturing establishments employed in the conversion of crude petroleum into various marketable products, the capital employed and the producing cost of their outturns, the figures show an increase in the number of establishments from 1900 to 1905 of 31, or from 67 to 98, while the capital employed in the industry has swelled no less than $40,952,649, or from $95,327,892 in 1900 to $136,280,541 in 1905. The value of the products increased within the same five years just $51,075,936. The salaries and wages paid had risen to $18,010,881, which is $6,151,543 in excess of those paid in 1900. And for materials used $139,387,213 was paid against $102,859,341. It would appear from this showing that the cost per unit of production was somewhat in excess of what it was five years ago, but there is no questioning the general increased prosperity. . . .

"Professor Munroe, after touching upon the statistics and their effect on trade, concludes his investigation with an exhaustive treatise upon the methods at present in vogue in the production of the various distillates and of the several uses of the latter for various commercial purposes. All tend to show an ever extending use of petroleum, which, despite discoveries in other competing fields, is steadily increasing its sphere of influence."

Ginn and Company, publishers, have recently announced in their College Greek Series, "The Attica of Pausanias" edited with introduction, notes, plans and excursuses by Professor Mitchell Carroll, head of the classical department of this University. "The Attica" constitutes the first book of Pausanias's "Description of Greece," which is the most important Greek work extant on the archaeology and topography of ancient Greece. Owing to the wide-spread interest in archaeological investigations, "The Attica" is now being published in separate form for the first time in England or America.

The text offered is that of Hitzig-Bluemner edition (Berlin, 1896). It is accompanied by a commentary which presents clearly and concisely the latest results of modern research in archaeology. A topical outline enables the student to follow without difficulty the course of the author. The more important topics, such as the Enneacrunus, the Agora, the Acropolis, are treated in a series of excursuses and illuminated with a rich supply of maps and plans. A select bibliography presents the most important reference books.

One of the most important publications of 1907 is the series of ten volumes bearing the general title of "Woman: In All Ages and in

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It is too early to speak of the results of the expedition, as the scientists who were engaged in it are now studying the data which they have collected, but there is every prospect of hopeful results. Dr. Bartsch has been granted a leave of absence from the University for this session in order that he may carry on certain investigations for the United States Government in the Philippines.

Dr. Frank H. Bigelow, of the United States Weather Bureau, who is Professor of Astro-Physics in this University, has been placed in charge of the investigations of the phenomena of evaporation over large bodies of water, recently undertaken in connection with the drying out of the Salton Sea in Southern California. This large body of water, 45 miles long and 10 to 15 miles wide, and containing 440 square miles of evaporating water surface, lies in a very hot and dry region and affords an excellent opportunity to study evaporation on a large scale. The previous researches have developed several formulas which give very inconsistent results, and generally it is not known how to apply the results observed on small pans to large bodies of water. In order to gain a preliminary view of this subject Professor Bigelow conducted a campaign on evaporation at Reno, Nevada, during the months of July, August and September, 1907. A series of towers were erected at the Reno Reservoir and it was shown that this body of water, about 1000 feet square, is covered by a vapor blanket only 30 feet deep, and over-stretching a very few hundred feet beyond the boundaries of the water. The evaporation from small pans was two or three times as rapid at the top of the central towers as at the water surface, and in fact the density and depth of this blanket of vapor is a principal function in determining the rate of evaporation. The work will be transferred to the Salton Sea, where the action of this blanket will be investigated on a larger scale. The fact that pans depend upon their immediate environment in the invisible vapor and covering that hangs over the water is sufficient reason why divergent results have been found by previous investigations. Nature throws a protecting cover of vapor over bodies of water which tends to conserve them from loss by evaporation, and it is now quite probable that the Salton Sea will dry out at a rate more nearly four feet per year than eight feet, as was very generally assumed. The definite knowledge of these broad facts is of interest to engineers engaged in irrigation projects, to growers of plants and to meteorologists generally.

UNIVERSITY APPOINTMENTS.

DEPARTMENT OF ARTS AND SCIENCES.

Assistant Librarian: M. ALICE MATTHEWS.

Graduate of State Normal School, Warrensburg, Mo., 1890; Bachelor of Library Science, University of Illinois, 1903; Assistant in Catalogue Division, Library of Congress, 1903-'05; Librarian, University of South Dakota, 1905-'07.

FACULTY OF GRADUATE STUDIES.

Assistant Professor of Mathematics: LOUIS COHEN, B.S.

B. S., Armour Institute of Technology, 1901; Graduate Student, University of Chicago, 1902-'03, Columbia University, 1903-'05; Bureau of Standards, 1905- —; Associate Member American Institute of Electrical Engineers; Member American Physical Society.

COLUMBIAN COLLEGE.

Professor of Greek and Latin: CHARLES SIDNEY SMITH, PH.D.

A.B., Princeton University, 1888; A.M., *ibid.*, 1891; Ph.D., Johns Hopkins University, 1906; Graduate Student, Princeton University, 1888-'90; Assistant Master, The Dupuy School, Trenton, N. J., 1890-'91; Instructor in Latin, Princeton University, 1891-'97; Student in University of Leipzig, 1897-'98; Graduate Student, Johns Hopkins University, 1898-1900 and 1905-'06; University Fellow, *ibid.*, 1900 (resigned); Assistant Professor of Greek and Latin, The George Washington University, 1900-'07.

Instructor in Romance Languages: HENRI BAULIG.

Bachelier ès lettres, University of Paris, 1895; Student, *ibid.*, 1895-'07, 1898-1903; Licencie ès lettres, *ibid.*, 1900; Diplomé d'études supérieures d'histoire et géographie, *ibid.*, 1901; Instructor in French, Harvard University, 1904-'07. American correspondent of *Le Journal des Débats* and *Annales de Géographie.*

Instructor in Botany: WALTER FISCHER, M.A.

B.S., Ohio State University, 1897; M.A., *ibid.*, 1905.

Instructor in German: WILLIAM B. SCHULZ, B.A.

B.A., Concordia College, 1894; Student George Washington University, 1905-'06; Catalogue Division Library of Congress, 1902- —.

Assistant in History: H. V. ARTHUR SCHOENFELD, A.B.

A.B., The George Washington University, 1907.

Assistant in Greek and Latin: M. WALTON HENDRY, A.B.

A.B., Johns Hopkins University, 1903; Instructor in Latin and Greek, Camden, N. J., High School, 1904-'06.

Assistant in Chemistry: WILLIAM E. HILLYER, M.S.

B.S., The George Washington University, 1899; M.S., *ibid.*, 1900.

COLLEGE OF ENGINEERING.

Assistant Professor of Civil Engineering: EDWIN V. DUNSTAN, C.E.

B.S., The George Washington University, 1905, C. E., 1906; Instructor in Civil Engineering, 1905-'07.

Assistant Professor of Civil Engineering: OSCAR A. MECHLIN, C.E.

B.S., Dartmouth College, 1903; C.E., The George Washington University, 1906; Assistant Engineer, District of Columbia, 1904-06; Instructor in Civil Engineering, The George Washington University, 1906-'07.

Assistant Professor of Mechanical Engineering: ARTHUR CUTTS WILLARD, B.S.

B.S., Massachusetts Institute of Technology, 1904; Principal, University School, San Francisco, 1904-'06; Instructor in Mechanical Engineering, The George Washington University, 1906-'07.

Instructor in Civil Engineering: F. CHARLES STARR, S.B.

S.B., Massachusetts Institute of Technology, 1905; Assistant in Civil Engineering, *ibid.*, 1905-'07.

Instructor in Mechanical Engineering: JULIAN C. SMALLWOOD, M.E.

M.E., Columbia University, 1903; Assistant in Mechanical Engineering, *ibid.*, 1904-'05; Superintendent, Hammerschlag Construction Company, 1903; Designing Engineer, Standard Plunger Elevator Company, 1906-'07.

Instructor in Electrical Engineering: CHARLES W. MORTIMER, M.E.

A.B., Mississippi College, 1902; M.E., Cornell University, 1907; Principal, High School, Hebron, Miss., 1902-'04.

COLLEGE OF THE POLITICAL SCIENCES.

Professor of Political Science: WESTEL WOODBURY WILLOUGHBY, PH.D.

A.B., Johns Hopkins University, 1888; Fellow, 1890-'91; Ph.D., Johns Hopkins University, 1891; admitted to the bar, 1892, and practised law in Washington, D. C., 1892-'97; "Lecturer" then "Associate" then "Professor" and now "Professor of Political Science" in the Johns Hopkins University, 1895- —; Managing Editor of the American Political Science Review; Secretary and Treasurer, American Political Science Association; and Editor of the Johns Hopkins University Studies in Historical and Political Science; Editor of the "American State Series."

Assistant Professor of Diplomatic History: WILLIAM RAY MANNING, PH.D.

A.B., Baker University, 1899; Graduate Student, University of Kansas, 1900-'02, A.M., 1902; Fellow and Assistant in English History, *ibid.*, 1901-'02; Fellow and Assistant in European History, University of Chicago, 1902-'04, and Ph.D., 1904; awarded the Justin Winsor Prize of the American Historical Association for Ph.D. dissertation on the Nootka Sound Controversy, 1904; Instructor in History, Purdue University, 1904-'07; Member American Historical Association; Member American Society of International Law.

Professor of Finance: HENRY PARKER WILLIS, PH.D.

B.A., University of Chicago, 1894; Travelling Fellow, *ibid.*, 1896; Ph.D., *ibid.*, 1897; Secretary, Indianapolis Monetary Commission, 1897-'98; Professor of Economics, Washington and Lee University, 1898-1907. Editorial writer, New York Evening Post, 1901-'02; Correspondent and Editorial Writer, New York Journal of Commerce and Commercial Bulletin.

Instructor in Political Science: HOWARD LEE MCBAIN, PH.D.

A.B., Richmond College, 1900, A.M., 1901; Assistant Principal Richmond High School, 1901-'04; President's University Scholar in Constitutional Law, Columbia University, 1904-'05, 1905-'06; Winner of Toppan Prize in Constitutional Law, *ibid.*, 1905; Honorary Fellow in Constitutional Law, *ibid.*, 1906-'07; A.M., *ibid.*, 1905, Ph.D., 1907; Lecturer in Constitutional History, University of Virginia Summer School, 1905. Member American Political Science Association, American Academy of Political and Social Science.

Lecturer on the Consular Service: JOHN BALL OSBORNE, A.M.

A.B., Yale University, 1889; A.M., 1894; American Consul at Ghent, Belgium, 1889-'94; Joint Secretary of the Reciprocity Commission of the United States, 1894-'95; Chief of the Bureau of Trade Relations, Department of State, 1895- —.

DIVISION OF ARCHITECTURE.

Assistant Professor of Architecture: CHARLES MASON REMEY.

Instructor in Architecture, The George Washington University, 1906-'07.

Assistant in Architecture: CHARLES R. LOMBARD.

DIVISION OF EDUCATION.

Professor of Philosophy, in Charge of the Division of Education: WILLISTON S. HOUGH, PH.M.

Ph.B., Ph.M., University of Michigan, 1884; Student in the Universities of Heidelberg, Halle, Berlin, Paris, and Oxford, 1884-'88; Instructor in Philosophy, University of Michigan, 1888-'89; Assistant Professor of Philosophy, University of Minnesota, 1889-'91; Professor, *ibid.*, 1891-'94; research, Bodleian Library, Oxford, and Royal Library, Berlin, 1894-'98; Literary work, New York, 1898-1901; Florence, Italy, 1901-'02; London, 1902-'04; Professor of Philosophy, The George Washington University, 1905- —; Member, The American Philosophical Association, The Southern Society for Philosophy and Psychology.

Assistant Professor of Educational Psychology: WILLIAM CARL RUEDIGER, PH.D.

Diploma, State Normal School, Stevens Point, Wis., 1897; Ph.B., University of Wisconsin, 1899; Ph.M., *ibid.*, 1903; Ph.D., Columbia University, 1907; Teacher in Graded School, 1893-'94; High School, 1899-'02; Assistant in Pedagogy, University of Wisconsin, 1902-'03; Professor of Method, Montana State Normal College, and Assistant Superintendent of Public Schools, Dillon, Montana, 1903-'05; Fellow in Education, Teachers College, Columbia University, 1905-'06; Assistant in Psychology, Columbia University, 1906-'07.

Lecturer on Educational Theory: ELMER ELLSWORTH BROWN, PH.D.

Diploma, Illinois State Normal School, 1881; A.B., University of Michigan, 1889; Ph.D., University of Halle, 1890; Principal High School, Jackson, Mich., 1890-'91; Acting Assistant Professor of Science and Art of Teaching, University of Michigan, 1891-'92; Associate Professor of Pedagogy, University of California, 1892-'93; Professor, *ibid.*, 1893-'98; Professor Theory and Practice of Education, *ibid.*, 1898-1906; United States Commissioner of Education, 1906- —; Member, National Council of Education (Pres., 1905); International Congress of Arts and Sciences, St. Louis, 1904.

Lecturer on School Administration and on Educational Theory: WILLIAM ESTABROOK CHANCELLOR, A.M., M.D.

A.B., Amherst College, 1889; A.M., *ibid.*, 1895; M.D., Long Island Medical College, 1892; LL.B., Harvard Law School, 1895; Lecturer Brooklyn Institute, 1895-'96; Superintendent of Schools, Bloomfield, N. J., 1897-1904; Paterson, N. J., 1904-'06; Superintendent of Public Instruction, District of Columbia, 1906- —; Lecturer on Education, University of Chicago (Summer Quarter), 1907.

Lecturer on the History of Education and on Manual Training: GEORGE EDMUND MYERS, PH.D.

A.B., Ottawa University, 1896; Student at the University of Chicago, 1899-'91; A.M., *ibid.*, 1901; Fellow in Education, Clark University, 1904-'06; Ph.D., *ibid.*, 1906; Teacher in Secondary School, 1896-'99; Teacher and Principal of High School, Colorado Springs, 1901-'04; Principal McKinley Manual Training School, Washington, D. C., 1906- —.

Lecturer on Child Study and on School Hygiene: WILLARD S. SMALL, PH.D.

A.B., Tufts College, 1894; A.M., *ibid.*, 1897; Student at Tufts Theological School, 1894-'96; Scholar and Fellow in Education, Clark University, 1897-1900; Ph.D., *ibid.*, 1900; Honorary Fellow, *ibid.*, 1901; Professor of English, Lombard College; Professor of Psychology, Michigan Normal College; Supervisor of Training School, State Normal School, Los Angeles, Cal.; Superintendent of City Schools, San Diego, Cal.; Principal Eastern High School, Washington, D. C., 1906- —.

Lecturer on General Method and on Nature Study: WILLIAM WESLEY BLACK, A.M.

Diploma, Indiana State Normal School, 1892; A.B., University of Illinois, 1898; A.M., *ibid.*, 1899; Teacher in Elementary and Secondary Schools; Superintendent of Public Schools; Head Critic, Illinois State Normal School, 1900-'01; Head Critic, Chicago Normal School, 1901-'06; Supervising Principal, Washington, D. C., 1906- —.

Lecturer on Classroom Management: STEPHEN ELLIOTT KRAMER, B.S.

Diploma, Washington Normal School, 1890; B.S., The George Washington University, 1906; Instructor in English, Eastern High School, Washington, D. C., 1891-'92; Principal of Smallwood School, 1892-'99; Principal of Force School, 1899-1902; Principal of Franklin School, 1902-'05; Director of Night Schools, 1903-'05; Supervising Principal, 1905- —.

DEPARTMENT OF LAW.*

Assistant Professor of Law: JOSHUA REUBEN CLARK, JR., LL.B.

B.S., University of Utah, 1898; Acting Principal, Southern Branch of State Normal School, Utah, 1900-'01; LL.B., Columbia University, 1906. Member of Board of Editors, "Columbia Law Review," 1905-'06. Assistant Solicitor, Department of State, September, 1906.

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* Announcement of appointments in the Faculty of Medicine is reserved for the December Bulletin, which will be devoted to the Departments of Medicine and Dentistry.

UNIVERSITY MISCELLANEA.

The Commissioners of the District of Columbia appointed as Delegates to the National Trust Conference which met in Chicago from October 22 to 25, President Needham, Messrs. Noyes, Edson, Jennings, and Woodward, of the Board of Trustees, and Professor Gore. The last named read a paper on "The Relations of Industrial Combinations to Export Trade," published in this number of the University Bulletin.

Professor Mitchell Carroll is one of the editors of the *Classical Weekly*, which is published as the organ of the Classical Association of the Middle States and Maryland. The first issue of this publication appeared October 5. The next meeting of the Classical Association will be held at the George Washington University in the spring of 1908.

Professor Henry Parker Willis, of the Faculty of Political Sciences, will deliver one of the principal addresses at the National Conference on Taxation, to be held at Columbus, Ohio, November 12 to 15. His subject is "The Relation of Federal to State and Local Taxation." Dr. H. L. McBain, of the same faculty, will address the Teachers Convention of Virginia at Richmond in November on the "Teaching of Civics in Schools and Colleges."

Mr. Charles M. Jesup, of New York, it is announced, will soon visit Washington for the purpose of addressing the students and organizing a civic league in this University, similar to the one he has organized in several of the large universities of the country.

Professor C. W. A. Veditz, acting dean of the College of the Political Sciences, gave a course of lectures in July at the summer school of the University of Illinois.

Dean Charles E. Munroe, Professor Frank Wigglesworth Clarke, and Professor Harvey W. Wiley, of the Faculty of Graduate Studies, were appointed on the Jury of Awards at the Jamestown Exposition, Dean Munroe being Chairman of the Jury on Chemicals and Allied Substances, and Professor Wiley being Chairman of the Jury on Foods.

George Horton, Esq., Consul General of the United States to Greece, who is a Doctor of Letters of this University, is now on leave of absence in this country and is on a lecture tour for the Archaeological Institute of America. The subject of his lecture is "The Greeks of Today." Dr. Horton will address the Washington Society of the Institute on November 20.

Dr. Theodore Gill, Professor of Zoology, attended the National Zoological Congress held in Boston last August. Dr. Gill went as the guest of the General Committee and was invited to deliver an address on " Systematic Zoology." Dr. Gill represented the United States under the seal of the State Department, the Smithsonian Institution, the Washington Academy of Sciences, the Biological Society of Washington, the George Washington University, as well as His Majesty the King of Siam. The Congress was attended by many distinguished naturalists from Europe, Asia, Australasia, and the Americas.

Professor James Brown Scott received the signal honor of being appointed Technical Delegate of the United States to The Hague Conference, which is still in session. Press dispatches indicate that Professor Scott has had an important share in the work of the Conference. He is expected to return to Washington about November 15, when he will resume work with his classes in International Law and Contracts.

Mr. Alfred Buhrman, an assistant in the office of the Clerk of the Supreme Court of the District of Columbia, has been appointed Clerk of the Moot Court to succed Mr. J. W. Latimer, who will give up the active duties of the Clerk's office in order to take charge of a course in Commercial Law for the students in the College of the Political Sciences and in the Washington College of Engineering. Mr. Latimer, however, continues to be in supervisory charge of the work of the Clerk's office and will also occasionally serve as Judge of the Moot Court.

At the last annual meeting of the Association of American Law Schools, held at Portland, August 26-28, Professor William R. Vance, Dean of the Law Department, was re-elected Secretary of the Association.

Professor Edward S. Thurston was a member of the "summer faculty" of the University of Chicago Law School during the summer quarter just past, having charge of the subject of mortgages.

Superintendent William E. Chancellor, M.A., Lecturer on Education, has just published through Houghton, Mifflin & Co. a vigorous, constructive discussion of educational problems under the title, " A Theory of Motives, Ideals, and Values in Education." Already widely known as the author of " Our Schools, Their Administration and Supervision," Superintendent Chancellor has added to his reputation as an authority on educational theory and practice by this unusually fresh and able analysis of modern education in its relations to various other social institutions.

Elmer Ellsworth Brown, Ph.D., U. S. Commissioner of Education, Lecturer on Education, received the honorary degree of Doctor of Laws from Columbia University at the Annual Commencement, June 12, 1907. The other recipients of this honor on the same occasion were Charles Evans Hughes, Governor of New York, and Henry Fairfield Osborn, first choice of the Regents of the Smithsonian Institution for Secretary in succession to the late Professor Langley.

William C. Ruediger, Ph.D., Assistant Professor of Educational Psychology, has published in the "Archives of Psychology" of Columbia University, a treatise on "The Field of Distinct Vision." This work, based upon extensive experimental research, has important bearing upon certain educational problems related to the psychology of reading.

Williston S. Hough, Ph.M., Professor of Philosophy, has ready for publication a translation of Eucken's "The Problem of Human Life," a work which has attracted wide attention in Europe as the most original, vital and idealistic expression of the great present-day movement in philosophic thought, calling itself variously The New Idealism, Personal Idealism, Humanism, and Pragmatism. The book has passed through seven German editions, and is being translated also into French, Italian, and Swedish. In the latter part of the work, Professor Hough has had the assistance of Boyce Gibson, of London University, author of "Rudolf Eucken's Philosophy of Life," etc. The appearance of the work in English is expected shortly after the Christmas season.

Douglass B. Sterrett, B.S., 1902, the George Washington University, sends the following papers which he has written, and which are published by the U. S. Geological Survey: "The Production of Precious Stones in 1906." "The Production of Mica in 1906." "The Production of Monazite and Zircon in 1906."

Ernest Brown, M.D., George Washington University, has, in conjunction with Lafayette B. Mendel, published in the Journal of the American Medical Association the following: "The Rate of Elimination of Uric Acid in Man."

"Science" for August 30, 1907, has an analysis of the statistics for the doctorate degrees conferred by the American universities for the past ten years. This is one instance of many showing that the conditions under which these degrees are conferred are being carefully inquired into. During all these years the work of our Faculty of Graduate Studies has been under close scrutiny. A list of the forty-one institutions conferring this degree is arranged in the order of rank and George Washington stands fifteenth on the list. From an analysis of the statistics of nineteen institutions it appears that the percentage of those admitted who have received degrees is about seven. From statistics recently prepared by Professor Munroe, Dean of the Faculty of Graduate Studies, based on the record of this faculty from its organization, it is worthy of mention that while four hundred and thirty-three candidates have been admitted here to candidature for the Ph.D. degree, of this number the degree has been conferred upon only thirty-four, or 7.8 per cent of the total. By this criterion we find that we stand in line with the best institutions.

Mr. Louis Cohen has been recently added to the Faculty of Graduate Studies as assistant professor of mathematics. Mr. Cohen was a graduate student of Columbia University and served as an assistant to Professor Pupin. He has done much research work under the auspices of the Carnegie Institution, and copies of several publications in which his results are recorded have been deposited in the University library. He will offer courses in the higher mathematics which are especially needed by advanced students in the physical sciences.

Columbian College is the center of an already large circle of university colleges and schools, all of them, with the exception of the college, the development of specialized scientific or professional aims in education. A college of self-culture is the centre from which schools of self-expression naturally spring. High thought and refined sentiment seek expression through the institutions of society, hence the college is the natural habitat of schools of medicine, law, political science, engineering, architecture, education; hence it is that when men would have all these flourish, they foster a college for personal liberal culture, and it is known by its fruits, for long ago such a college began to be called a college of arts and sciences.

The new year at Columbian College is specially notable for two things. First the great increase in the number of courses of study in important subjects, redeeming the pledge of President Needham at the annual commencement in June, that the strengthening and development of the educational work should be the first care of those having in charge the University interests, and second the opening of the Woman's Building, according better facilities for class instruction, dormitory privileges, and the college life of the young women of the College.

The new Woman's Building which is opened this fall is situated at 1536-38 I Street, about four minutes' walk from the main building of the University. The upper floors will be used as a college dormitory for women, and the first and second floors contain lecture rooms, reception, committee, and dining rooms. College girls may obtain board and rooms in the building at reasonable rates. The Dean of Women has an apartment and office in this building and will supervise the appointments of the house and the College interests. The young women of Columbian College will have for the first time this winter an educational and social center of their own. For all this the University and the girls are largely indebted to the society of the Columbian Women, the ladies of which have raised money for furnishing the building and given much time and care to the furtherance of the project.

The Washington College of Engineering has entered upon the most successful session in its history. With its enlarged quarters in two of the six I Street buildings recently rented by the University and with three additional instructors, very decided improvements have been made in the courses of study. The I Street houses contain four excellent recitation rooms, four drawing rooms so connected by doorways as to be equivalent to a large room, a library, a student social room, rooms that can be assigned to advanced students for special work in drawing in connection with their theses, and offices for all members of the faculty. The dynamo laboratories and steam and gas engine laboratories are all in the main University building and their equipment is very satisfactory. The growing prestige of this department is shown by the large increase in the number of students.

The Division of Architecture is now housed in its new quarters at 1532 I Street, and has also experienced the advantages of its enlarged quarters. The architectural library through purchases and loans of important works by Professor Ash and Remey is in a far more satisfactory condition than ever before.

The faculty of the new College of the Political Sciences is this fall larger than ever before because of the increased scope of the work and the introduction of undergraduate courses, in addition to the graduate work previously offered. The new appointees, whose academic biographies will be found elsewhere in this bulletin, are: W. W. Willoughby, Ph.D., who is Professor of Political Science; Henry Parker Willis, Ph.D., Professor of Finance; William Ray Manning, Ph.D., Assistant Professor of European History; Howard Lee McBain, Ph.D., Instructor in Political Science; and Mr. John Ball Osborne, M.A., Lecturer on the Consular Service.

On the fifteenth of October the total registration of the new College was nearly forty, and of this number a large majority were candidates for the undergraduate degree of Bachelor of Arts. The new College has a larger percentage of students who come to us from other institutions than any other college of the University. Among the newly enrolled members are graduates of Cornell University, Boston University, University of Wisconsin, Harvard University, Amherst College, the University of Costa Rica, the University of Virginia, and Williamette University.

Inasmuch as several students who have made application for admission have not yet reached the city, it is highly probable that the total enrollment will considerably exceed forty for the present year. This means, even if there should be no increase in the enrollment each fall that there will be a total enrollment of over one hundred three years hence.

The Division of Education, which was established by the Board of Trustees in the spring of the present year, has inaugurated its work at a favorable moment. There is now a considerable local demand for the collegiate training of teachers. The Washington Normal School provides a good short course, consisting largely of practice work. But a full college course, combining with the strictly pedagogical training, broad and thorough training in the arts and sciences, is also in demand; and the prompt response which the courses offered have met with on the part of the teachers of the District shows that the University is meeting that demand.

The Division of Education is housed at 1534 I Street. The accommodations include the office of the Professor in charge, a cloak room, and a department library, on the first floor; a recitation room, and a large lecture room on the second floor; a recitation room, two offices, and a photographic dark room, on the third floor; and four rooms *en suite* on the fourth floor to accommodate a psychological laboratory for experiments relating particularly to educational problems.

The teaching staff for the professional courses comprises two professors and six special lecturers. There are offered 27 undergraduate and graduate professional courses. In all probability the program will be extended before another year.

The Department of Medicine is responding handsomely to the new policy of making the school an institution for students who can give their full time to the work. It is interesting to notice that the number of students who have matriculated this fall for the full day course is more than half the total registration. It is also significant to notice the decrease of the number of students with other occupations. Beginning with this year the Department requires the student having but part of his time for study to take an extra year to obtain his degree. There are, therefore, two distinct classes of students, one the full-day class taking four years, and one the part-day class, taking five years. Improvements have been made in the physiological laboratory. The histology laboratory has also been equipped with the necessary apparatus for beginning a laboratory course in embryology.

The National College of Pharmacy has recently established chairs of mercantile pharmacy and pharmaceutical jurisprudence, which are now in active operation. The first lectures were delivered on October 8. The faculty for the session of 1907-8 consists of eight professors and three instructors.

The practice of giving a large part of the instruction in the Law Department in the forenoon, which was last year inaugurated with the First Year Class, has this year been extended to the Second Year Class. A further extension will next year be made to the Third Year Class, when all of the undergraduate work in the Law Department will be on the full-day basis. Provision will, however, continue to be made for those students who are so occupied in the day time as to be unable to attend the morning lectures, although such students will be required to take four years for graduation.

It is gratifying to observe that already the reputation of this Department of the University has been distinctly enhanced in the world of legal education and scholarship by reason of this stand taken for thorough work and sound scholarship. It is also noteworthy that the principle of requiring a longer period for students who are employed a large part of the time, has gained very general recognition in the legal profession. Such a requirement is recommended by the American Bar Association's Committee on Legal Education, and will doubtless soon receive the sanction of the American Bar Association, and of the Association of American Law Schools.

While the completed registration will show only a slight increase in the number of students in the Law Department, yet there is abundant evidence that the difficult task of putting the Law School on a basis of full-day work shows substantial and satisfactory progress. The percentage of students who have come to Washington solely for the purpose of pursuing the study of law in the University has materially increased, and the character of the work in the class-room gives noteworthy proof of the better results to be obtained from the use of more scientific methods of instruction.

President Needham is now giving the following series of addresses at the University Assembly held regularly at noon on Wednesday of each week:

First Series—Ideals: What Ought We to Be? October 2—Self-sustaining; Equipment. October 9—Self-governing; Morality. October 23—Self-respecting; Personality. October 30—God-fearing; Religion.

Second Series—Methods: How Shall We Become What We Ought to Be? November 6—Instincts; Inherited Habits. November 13—Memory; Accumulated Capital. November 20—Imagination; The Studio; November 27—Reason; The Master Workman. December 5—Habits; a High Efficiency. December 11—Liberty; the Watchword. December 18—Service; the Goal.

Intercollegiate debating at The George Washington University continued during the last academic year to be as successful as in previous years. Last year three intercollegiate debates were held, as follows: With the University of Cincinnati, in March, the University of North Carolina, in May, and with Syracuse University in June, each resulting in a victory for the representatives of this University. The defeat of Syracuse University was our seventh consecutive victory in less than three years, and the complete record of the past five years shows that out of twelve debates, ten have resulted in victories for The George Washington University. This record, it is believed, is equalled only by Harvard University and the University of Wisconsin.

The fall convocation of the University was held on Wednesday morning, October 16, at 10.30 o'clock, in Belasco Theatre. The invocation was pronounced by Rev. W. C. Alexander, D.D. The address of the occasion was made by Dr. E. Benjamin Andrews, Chancellor of the University of Nebraska, who spoke on "Phlegm *versus* Frenzy in Some Current Discussions." An abstract of the address is published in this number of the BULLETIN. At the conclusion of the address the following degrees were conferred:

Bachelor of Arts, Albert Perkins Tibbetts, New Hampshire; Bachelor of Science, William Alexander Boyd, North Carolina: Doctor of Medicine, Arthur Compton, District of Columbia; Clarence Mazarine Dollman, Virginia, John Lee Grant, Virginia; Eben Wesley White, New York; Bachelor of Laws, Henry Palmer Alden, District of Columbia; Joseph McCarter Bowyer, Pennsylvania; Frank A. Law, Jr., District of Columbia; Henry Petingale Merrill, District of Columbia; Jackson Morris, Kentucky; William Thomas Peake, District of Columbia; Ora Herbert Roberts, Indiana; Eugene Washington Staples, Maine; Omar Jay Veley, New York; Frederick R. Whippler, District of Columbia: Master of Laws, Walter Allwood Sommers, New York: Master of Patent Laws, Fred Merriam Hopkins, Michigan; Arthur Minnick, Illinois. After the morning exercises a luncheon in honor of Chancellor Andrews was served at the Shoreham Hotel, to which members of the Board of Trustees and of the University Council were invited.

At the meeting of the Board of Trustees of the University held Wednesday afternoon, October 16, a committee to select a site for the University and to make a report to the Board in reference to the respective values of all available sites, was appointed. The committee is composed of President Needham, ex-officio, Commissioner H. B. F. Macfarland, chairman of the Board, and Messrs. S. W. Woodward, Hennen Jennings, H. C. Perkins and Justice T. H. Anderson. Among the sites which this committee will examine is the Dean property at the intersection of Florida and Connecticut avenues; the Sherman Barber tract, Fourteenth Street, north of Florida Avenue; the site at the intersection of Sixteenth Street and Columbia Road; the Woodley Park site; a site on Massachusetts Avenue west of the new Rock Creek Bridge; and a site in the neighborhood of the Congressional Library. As soon as this committee is ready to report the Site Fund Campaign Committees will at once renew their campaign for the completion of the $200,000.00 site fund subscription to be made by the people of Washington, three-fourths of which is already in hand in good subscriptions.

VOLUME VI NUMBER 4

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The
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Bulletin

DEPARTMENT OF MEDICINE NUMBER

Washington, D. C.
Published by the University
December, 1907

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VOL. VI
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The George Washington University Bulletin

DECEMBER, 1907

DEPARTMENT OF MEDICINE NUMBER

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* Died, October 20, 1907.

EDITORIAL NOTE.

THE GEORGE WASHINGTON UNIVERSITY BULLETIN is published four times a year, under the editorial supervision of the Board of University Publications, appointed by the President's Council. It is the purpose of the Council to make the BULLETIN an organ of the educational and scientific activities of the University. The University Catalogue constitutes one number. Others are devoted to information of special interest to the Alumni and patrons of the University. Scientific numbers are published from time to time containing contributions from instructors and graduates and information regarding books, monographs, and papers published by them under other auspices.

The present Scientific Number is devoted especially to the Department of Medicine, and a number of papers are presented from members of the Faculty and Alumni, most of which were read before the University Medical Society. It also contains notes bearing on investigations and researches being made by instructors in this department, announcements of recent appointments, and miscellaneous items of University interest. The Board desires to be kept informed as to the academic record, publications and professional appointments of instructors and graduates in all departments of the University. Communications may be addressed to the Chairman.

The thanks of the Board are gratefully extended to the Advisory Committee of the Department of Medicine, consisting of Dean Phillips and Professors Franz, Nichols, Richardson, and Yarrow, for their co-operation in the preparation of this number.

Were we to inquire, even in the schools that retain the anatomical standpoint, what the duties and the functions of a physician or surgeon are we should undoubtedly find that, in spite of the tradition, the answers would indicate a change from the exclusive structural to a juster appreciation of the functional standpoint. The function of the physician and the surgeon is the same. He who has charge of the health of a part of the community has one aim whether he uses the methods usually called surgery or those called internal medicine. This aim is a physiological one, one dealing with the functions of the body almost exclusively. This aim is to get the sick well and to prevent the well becoming ill. The aim is to get the body that does not properly function to perform its functions better; to prevent the improper functioning of bodies that are now well. Whether a leg is to be amputated or a headache treated the aim, consciously or unconsciously realized, is to make the body perform its functions normally or more normally than when the treatment was begun.

As indicated above, there are several methods used to restore or to preserve health. In the schools the methods of surgery and administration of drugs have been taught exclusively. These methods have been emphasized because of the materialistic view of life and because the extra-bodily causes of disease are more easily understood. The intra-bodily causes of disease have been disregarded, and for this reason charlatans of all kinds have been able to flourish and to grow rich. Mountebanks and fakirs of pleasing address and with a persuasive tongue have been able to gather their greatest gains from, and often in return to cure the ills of, patients who have no known cause for their bodily disorders, and who have been too summarily turned off by regular practitioners of medicine.

This is not the place to discuss in full the causes of disease or the different methods that have been found useful for the relief of ills. At the present time I desire solely to emphasize the importance of keeping in mind the fact that there are some ills not yet correlated with bodily changes, that the causes of the conditions are often intrabodily, and that neither medication nor surgical operations are indicated. These pathological conditions are now known to be matters for careful psychological study and treatment, not for symptomatic prescription.

Psychology has been defined as the science of mind. It is the careful study of everything mental, how the mind works, how it is affected by external agents, how it can be made to work in certain directions, how, in fine, it can be made to affect the body (the extra-mental part of the individual) for well or ill. It includes the study of the mind or mental states in all kinds of people and animals, and if mental states are to be found in plants and rocks it will include the study of the mental side of the flower or the stone. The field of psychology is as broad as mentality. It embraces the whole domain of mental phenomena, but for our purpose here we need consider only a small part of the field, that in relation to human activities.

Each one appreciates that he has within himself or that he has as part of himself something that is called "mind." The thing that is called mind differs from most of the individual in that it is something that cannot be seen, felt or heard or appreciated by any other person through the medium of the senses. To oneself the mind, in other words, is immediately given, to others it cannot be sensed but can be only surmised and only mediately appreciated. Mental states are individual and are only directly known to and knowable by the individual having them. By a series of deductions we may come to the conclusion that another individual has mental states and from a long series of experiences we have come to judge fairly accurately from his words and actions what sort of mental processes a certain man has at a given time. From another series of observations and deductions it has become apparent that the mind is somehow dependent on the part of the body we call the nervous system.

Although it is generally admitted that the nervous system is the part of the body most intimately connected with mental processes, it is also understood that the action of a nerve cell is different from the sensation or the idea. Sensations and ideas are correlated with or coexistent with the changes in the nervous system, but the physical and the chemical changes in the cerebrum, for example, are different to the mental states. The physical phenomena differ from the mental in that the former may be measured in many ways, the latter little if at all. The physical differs from the mental also in that we know the former to be different kinds of energy more or less well known, whereas the latter, as Ostwald avers, may be some form of energy, the character and relationship of which are unknown and possibly unknowable.

The fact that psychology has to deal with the mental side of the life of an individual gives at once an indication of the place the science should hold in the medical curriculum. We depend upon the mental acuity and integrity of a patient for the information that will enable us to make proper diagnosis, and at the same time to understand the course of the disease. In many cases where the mental processes are abnormal this condition in itself is the means for diagnosis and the only means. In some diseases it may be possible to diagnose the condition from physical signs or without any information from the patient or from friends or relations. This is, however, possible in only a few of the diseases and even in these cases the external signs of internal conditions of a mental order, such as sensations of pain or feelings of discomfort, are most valuable in limiting the diagnosis to a few possible conditions.

Not only do we depend upon the mental condition, the sensations and the feelings, of the patient for information of diagnostic value, but the mental state or the mental attitude of the patient is of some help in prognosis. To mention only one example we may cite the condition of interest on the part of the patient. While not mentioned in many text books of medicine as of importance for diagnostic or prognostic purposes the signs of a patient's interest in and appreciation of the things that go on give many physicians an idea of the condition of the patient not to be obtained from percussion or auscultation or the thermometer. In the above I have purposely used the words many physicians. This is because there are some physicians who do not carefully or even casually observe the mental symptoms and concomitants of diseases. Most of these are recently graduated from the medical schools, who following accurately the instruction they have received look for all the physical signs but who, untrained in the observation and interpretation of mental signs, do not take into account the diagnostic and prognostic indications of physiognomy and general behavior.

In some diseases the mental changes and differences in behavior, which are indications of mental activities, are the only indication of abnormal functioning. In many of these cases, which have been grouped under the general term "insane," there are to be found no marked changes in the functions of the vital organs. The heart and the circulatory system, the intestinal tract and digestion, secretions and the secretory organs are normal. Even the nervous system, so far as it can be studied by the usual clinical means, is normal. Only the activity and the feelings of the individual may be changed. The patient may feel depressed and remain quiet. He may require many times the normal amount of stimulation to bring about normal activity, although he can and does feel as acutely as another individual we choose to call normal. Or, on the other hand, he may appear to be hyperexcitable, with an apparent increase in his motor activity, and he may be unduly sanguine, even joyful, about matters that would depress an ordinary normal man. In these individuals the physical changes accompanying the disease are so insignificant and so inconstant that they can not be considered to have more than a passing place in the condition. Preeminently, the disease is the change in the mental condition of the individual. It is a change in the functions that are termed mind.

For many years it was supposed that, owing to the brilliant results of the investigation of non-mental diseases by means of the microscope, the only means of determining the cause of the mental change in the insane would be by studying stained sections of nerve cells and nerve filaments. For twenty-five years this work has been occupying the attention of the student of mental diseases and with a very small return in so far as the mental aspect of the diseases are concerned. In some types of mental disease nothing has been discovered in the cerebrum or other parts of the nervous system that can not be found in perfectly normal people. The anatomical study to correlate mental changes with supposed brain differences has been unproductive. This is so even in such conditions of the nervous system as paresis, where the cerebral and other changes are most marked. The structural changes in paresis have been followed to such a degree that we are able to understand why there are found in addition to the mental picture the functional neurological differences in the reflexes and voluntary actions but no one has yet explained why in this type of disease we so often find the feeling of well-being accompanying a condition of the body far from well. I shall not predict that in these cases we shall be able to explain the condition from purely psychological study, but it appears probable that more light will be shed on the problem by such investigations.

In all types of mental disease the functional, or, more restricted, the psychological, study has been taken up with energy during the past few years, and we are just beginning to understand the problems from the new standpoint. Mania and melancholia, the types in olden days of two opposite diseases, are now known to be one. Instead of having an increased mental activity the maniacal individual has been found to be slower than normal, and in this respect to approach the type of the melancholic who is evidently slow. He has no increase in mental rapidity or in mental power, but is less able mentally just as is his fellow patient, the melancholic. Hysteria is purely a mental disease. Dementia precox is a mental change in an individual which has not yet been found to have any changes in the cerebral cells. Even with our most advanced methods of brain research with microscope and microtome we are as far from understanding many of the diseases of the mind as we were twenty or more years ago, and only by careful mental examinations have we been able to unravel the tangle to some extent.

So far we have considered the place that psychology has in the observation of cases for diagnosis. It has also a prominent position, which it has not hitherto been granted, in the treatment of many disorders. The subject of the influence of mind over body is a popular one and one that has received a large amount of attention, but not from the medical profession. We all have had the experience or have seen others having the experience of relief from pain during a period of time filled with matters of interest and importance. When the attention had passed from the sensation of pain to other sensations and ideas, the pain for the time being ceased to exist, to return when interest in the other things ceased. The introduction of a new element into the field of consciousness has, we may say, inhibited the old and so long as the new is in focus the old is out of focus. The presence of certain stimuli will prevent the appreciation of other stimuli given at the same time. In an extended form this is one of the most powerful of the psychic methods of treatment, the substitution of one mental state for another. This substitution may take the forms of amusement, instruction, travel, and many other occupations.

In some cases it is possible to produce a cure by substituting punishments instead of pleasant occupations. The use of the cautery on the spine or the application of an electric brush has been found to be of great assistance in the cure of conditions obstinate to all kinds of medicinal agents. In such methods suggestion plays a large part, and in some of the older popular methods it is the whole. Examples of the latter are the use of a placebo and bread pills. With all our knowledge of the finer anatomy of diseased tissue the placebo still remains one of the most powerful medicines in the hands of the physician who appreciates how and when to use it. And there must be added to the methods hinted at above that of suggestion in the hypnotic state. This is the mental method par excellence, and is to be used only on special occasions and after others have failed. By it almost anything may be done, from relieving some of the distress of asthma to changing the habits of wayward boys.

A careful perusal of the leading text-books of physiology will show that already in the medical schools psychology has a place. Disguised under the name of physiology, sensations and perceptions take the place of unknown physiological processes in discussions of the brain and the special senses. The formation of images on the retina is a part of physiological optics. The phenomena of contrast and color, as well as of the estimation of space and size are psychological. The sensations of tone are strictly mental phenomena, the vibration of the basilar membrane, if this is what happens in the ear, is physiological. Pain, touch, heat, and cold are sensations from we know not what in the skin. Smell and taste sensations are received from terminal organs of the activity of which we are ignorant. So it is in the cerebrum. We talk glibly of sensation and perception centers, of areas for associational processes, but while the psychological analysis has been carried to a correspondingly high degree of perfection we are almost as ignorant of the physiological cerebral processes as we were fifty or a hundred years ago.

It is to be seen, therefore, that psychology or psychological methods are of value for diagnosis, not only of mental diseases, but of the so-called bodily diseases. They are important also for determining the prognosis, and the psychological methods have, or rather should have, an equal consideration with the other methods of medical procedure, the administration of drugs and the knife. Does this mean that there should be introduced into the already crowded curriculum of the medical school an additional course or courses? The answer to the question depends upon the relative emphasis that is already laid on the mental side of disease in the courses given in the schools. In some schools, the only reference to psychological matters is to be found in the courses of the physiological department. In a few, judging by the recent utterances of members of the faculties, some attention is now being paid to this hitherto neglected field. The answer also depends upon the character of the students. If the students on entrance have had some training in mental science, the practical application of the facts learned in college courses may be made easily, but it must not be forgotten that in most institutions courses in psychology are composed of material that has little or no known value in medical science and practice. There would be many advantages in having special courses in psychology for medical students, just as there are advantages in having special courses in physics or mathematics for students of engineering or architecture, or just as there are special reasons for having courses in Biblical and Patristic Greek for students of theology. The facts and principles of any given subject are the same regardless of what application may be made of the facts and principles, but in professional study and use certain facts and principles are more and oftener applicable than others. The facts and principles applicable in any work should hold a prominent place in courses designed for the preparation of the men who are to make the application, and for this reason special courses in psychology for medical students are desirable, perhaps necessary.

A course similar to the one outlined by Professor E. C. Sanford, of Clark University, with modifications to suit the needs of medical men, is the sort of a course in psychology from which not only every student but every practitioner of medicine would profit.*

Not the psychology of the anatomical elements of mind, sensations and their qualities, perceptions and perception complexes, attention and will, but the psychology of the mind as a whole and especially of the mind in its relation to every day life must be the subject of a course for medical men. Such a course should consist of lectures delivered by some one of large experience, who would take up among other things: the psychology of belief, of hypochondriasis, of illusions, hallucinations and delusions; the psychology of the crowd with its application to epidemics and especially nervous disorders; suggestion in its various forms and application; the expression and the interpretation of the feelings and emotions. In this series of lectures the dissection of the mind and the labeling of its parts have no place; terminology and definition are to the student of little import as compared with the grasp of the psychical point of view. Systematic psychological training may well be added, but the first requisite is that the student shall thoroughly understand the part that mind plays in the world as shown by the foibles and the disordered beliefs of the present and the past centuries. For careful appreciation and thorough understanding of the mental state of an individual more systematic knowledge is necessary, but only a few need have the special training. All should have the general training and the opportunity of acquiring the psychological attitude.

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* Professor Sanford's paper on this is well worth reading and digesting. Although he discusses the requirements of the subject for students in any branch of knowledge, his remarks are applicable to the medical school more than to any other professional college. E. C. Sanford, A sketch of a beginner's course in psychology, *Pedagogical Seminary*, vol. XIII, 118-124, March, 1906.

It has been said that all of us are psychologists in a very practical way, that we are psychologists in as much as we interpret the actions of our fellows in terms of our own mental make up, and that in so far as we interpret the actions rightly are we not only good psychologists, but also successful in our dealings with our comrades and dependents. It is upon the degree of the ability to interpret the actions of others properly that success depends. In none of the professions is it so necessary for the success of the practitioner to have accurate judgments made, in none do the comfort and life of the patient depend on this so much as in the profession of medicine. The daily attendance on patients, the meeting and consultations with relatives and friends require that the physician be an excellent judge of human nature, be in other words a successful and observing psychologist. Observation, diagnosis, assiduous attention, and the sending of bills have been said to be the main qualifications for a successful practitioner of medicine. All four require considerable insight into the mental characteristics of the patient and the family, all require the application of psychological principles to the matter in hand. One may well be a successful medical man without being able to define accurately what is meant by apperception, or belief, or consciousness, or the self. He has had experience that enables him to know a patient believes or apprehends certain things, but the understanding of the belief or of the apperception is to be gained by only long and weary personal investigation if the thoughts and experiences of others have not been drawn upon and made the basis for personal observation and deduction.

It is an old fallacy to say that each of us has a mind and that for this reason each one is able to observe and to record mental facts of value. It is just as unquestionable that each of us has a body and that we are, thereby, able to observe and to add to the sum of human knowledge about the body. Just in the way that we have some knowledge of the body, of the presence of lungs, heart, brain and bones, have we knowledge of psychical things, of memory, attention, sensation. Without special training or long experience we are able to judge and value mental conditions about as well as we are able to construct anew the sciences of anatomy or physiology without the special training to be received in the laboratories devoted to these sciences and without the knowledge of the development of these subjects during the past. For the proper preparation of men to care for the health of the individual or the community some psychological training is necessary. He will be the most successful who has knowledge not only of the body and the action of drugs, but who also has knowledge of the action of mind.

The medical schools and the medical faculties must realize that they can not afford to permit students to pass through their medical preparation without at least a fundamental knowledge of the mental side of life. It is necessary, nay demanded of them, that the graduate be prepared to appreciate the power of the mind for health or illness, that he be given at least a view of mental conditions, mental signs, and mental therapeutics, and that he be prepared to treat the cases now turned over for exploitation, and often cure, by charlatans. It was one of our professional humorists, I believe, who wrote that if the Christian Scientists had more science and the doctors more Christianity, and if a patient had a good nurse his chances of living would be greatly increased. It is not Christianity the doctor needs, his daily life and good works show that he has the Christian spirit, but he does need the thing on which the Christian Scientist depends, a knowledge of or insight into mental states, in other words, psychology.

epidemics and especially nervous disorders; suggestion in its various forms and application; the expression and the interpretation of the feelings and emotions. In this series of lectures the dissection of the mind and the labeling of its parts have no place; terminology and definition are to the student of little import as compared with the grasp of the psychical point of view. Systematic psychological training may well be added, but the first requisite is that the student shall thoroughly understand the part that mind plays in the world as shown by the foibles and the disordered beliefs of the present and the past centuries. For careful appreciation and thorough understanding of the mental state of an individual more systematic knowledge is necessary, but only a few need have the special training. All should have the general training and the opportunity of acquiring the psychological attitude.

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The report of the committee just named was submitted to the Medical Society on June 6, 1894, and sustained all that had been said by Dr. Smart. The report called attention, among other things, to the fact that there were in use in the District 201 public wells, the number having been reduced from 289 since the year 1888, and to the existence within the city of 8,959 box privies and in the county of 5,133, a total of 14,092.* The report concluded with the following recommendations:

"The committee would urge upon the Medical Society the importance of taking the initiative in the effort to control the spread of this destructive but preventable disease by urging upon our municipal government, and upon Congress, the prompt adoption of measures to remove the causes to which this report has drawn attention.

"The measures to be recommended are:

"1. The immediate abandonment of all wells within the city limits, exception only to be made in case of the absence of the Potomac supply, and where the wells, after repeated chemical and bacteriological examinations, have been found to be free from all possible sources of danger. But even these to be abandoned as rapidly as possible.

"2. Purification of the sewerage system already existing, by replacing as rapidly as possible all damaged or defective drains.

"3. The introduction of new sewers in advance of other improvements in parts of the city not now supplied with drainage, and the extension of the system as far outside of the city limits as the rapidly growing population demands, so as to prevent soil contamination.

"4. The adoption of some system by which the lower sections of the city can be more completely drained and the risks arising from the backing up of tide water and sewage prevented.

"5. The final and safe disposal of the sewage.

"6. To make all existing privies, vaults, or other receptacles of human excreta water tight, and by rigid inspection and penalties to prevent the danger from leakage and overflow.

"7. The early completion of the plans recommended by Col. Elliot, in charge of the Washington Aqueduct, and now in course of execution, which have in view the sedimentation of the Potomac water, and ultimately the completion of works for filtration, the only proper method of purification.

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*These figures may be regarded as a fair index of existing conditions, although their accuracy is, I believe, open to question. So with respect to the number of wells closed from year to year as shown in the appended table; the exact number closed each year has been difficult to ascertain, but there has been a general movement toward closing shallow wells until in May, 1907, the number existing was sixty-two, and these excepting nine were closed by Commissioners' order of May 21, 1907. The figures in the appended table showing the number of box privies abandoned from year to year are accurate, but it is difficult to tell the number now in existence. It is believed, however, that the number would not exceed 4,000 in the entire District.

"8. The suppression of all privies and the enforcing of the law to make sewer connections.

"9. Careful inspection of all dairies in the District from which our milk supply is drawn, and the enactment of a law by which no milk shall be sold in the District without a permit from the Health Office. The inspection should cover an examination at the dairies of all possible sources of infection, including the water supply.

"10. The urging upon the members of the profession of a careful collation of all facts bearing upon the mode of infection in each case, and the advantage of reporting such facts to the Society, and the propagation of the doctrine that immediate disinfection of the stools is the first duty of the physician as guardian of the health of the community."

Entirely without reference to any supposed effect on the prevalence of typhoid fever, action had been taken even before the report of the above named committee was made, to carry out some of the projects which the committee recommended. Under the provisions of the act of Congress of March 2, 1889, making appropriations for the expenses of the government of the District of Columbia, the President of the United States had appointed a commission to examine and report upon the system of sewerage existing in the District of Columbia, and to make such suggestions and recommendations for the modification and extension of the same as they deemed necessary or desirable, and the report of the committee had been duly submitted to Congress and printed. The use of the Dalecarlia receiving reservoir, a storage basin with a capacity of about 150,000,000 gallons, had been discontinued in 1888 because of the turbidity and impurities introduced by the Little Falls branch, from which a part of its supply was received, with the result, however, of diminishing the period of sedimentation of the general water supply of the city. The appropriation act of March 3, 1893, had provided for the improvement of this reservoir so that it might be restored to use. A bill providing for the better regulation of the milk supply of the District had already been introduced into Congress and was then under consideration by the Medical Society, whose advice with respect thereto the Commissioners of the District of Columbia had requested.

The Medical Society, however, with commendable promptness appointed a committee to submit to the proper committee or committees of Congress the report that had been made concerning typhoid fever, and on June 14 the report was submitted to the Committee on the District of Columbia of the House of Representatives and published as an official document. During the same year, the officer in charge of the Washington Aqueduct, Col. George H. Elliot, Corps of Engineers, U.S.A., submitted in his annual report a lengthy statement relative to the filtration of the Potomac River water, in which he concluded as follows:

"It is expected that when the works of improvement required for restoring to use the Dalecarlia receiving reservoir shall have been completed, at the end of this fiscal year, the time during which the water may be "settled" before it is sent to the city from the distributing reservoir will be so much increased (it will be doubled) that the condition of the water as to color after high-water and freshets in the Potomac and its tributaries will be much improved, and that when the new reservoir near Howard University,* which is to contain 300,000,000 gallons of water, shall have been finished and brought into use, there will be but little to be desired in respect of the quality of our water supply."

Coincident with the inauguration of its work toward the improvement of the water supply of the city, the Medical Society had taken vigorous action toward the bettering of the milk supply. At the meeting held on June 13, 1894, the Society approved the draft of a bill to regulate the production and sale of milk in the District of Columbia, and submitted it to the Commissioners as a substitute for the measure that the Commissioners had referred to the Society. The bill, substantially as drafted by the Medical Society, became a law on March 2, 1895. No sufficient provision was made, however, for its enforcement, and, therefore, really efficient work under it did not begin until several years later. On July 26, of the same year, 1895, the Dalecarlia reservoir was put into use, thus increasing very materially the sedimentation of the Potomac River water before its distribution. Typhoid fever was, however, so prevalent during the summer of this year that, at the request of the Health Officer, Dr. Kober assumed the duties of special medical inspector to inquire into its causes. His report was submitted to the Health Officer under date of November 27, 1895, and concluded with the following recommendations:

"First. The immediate closing of every well in the District wherever a better water supply can be obtained.

"Second. The early completion and extension of all necessary sewers within the city limits, and the enforcement of the law to make sewer connections.

"Third. The abandonment of all box privies within the city limits and the enactment of more stringent laws for the prevention of soil pollution, together with a rigid, frequent, and systematic inspection of all box privies in the suburbs.

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* This reservoir has since been named the Washington City reservoir.

"Fourth. The improvement of the Potomac water by means of filtering basins, and the extension of the water supply to the suburbs at the earliest moment practicable.

"Fifth. Such measures as may be necessary to improve the sanitary condition in the lower part of the city, along the Potomac and the Eastern Branch, looking to the reclamation of stagnant and polluted marshes, and the prompt disposal of the sewage.

"Sixth. The enactment of a law requiring notification to the Health Officer of all cases of typhoid fever and other infectious diseases in the District of Columbia, together with a rigid enforcement of the building regulations requiring the cementing of cellars and basements, to prevent contamination of the air from polluted subsoils, and the systematic inspection of dairies inaugurated by you.

"In the meantime, as a preventive measure I earnestly recommend to the public the thorough disinfection of the excreta from all typhoid fever patients and greater care on the part of those connected with the sick, together with boiling the water and milk supply."

The recommendations made by Dr. Kober were promptly approved by the Health Officer and forwarded to the Commissioners with the recommendation that the Health Department be provided with means for conducting at all times inquiries similar to the one which Dr. Kober had made, but relating not alone to typhoid fever but also to all preventable diseases. The Health Officer recommended further that in addition to the construction of filter beds to remove impurities which could not be prevented from entering the river, steps should be taken to reduce to a minimum the amount of such impurities, and that, to that end, the Potomac basin be surveyed with special reference to the then present and prospective sources of contamination of the public water supply, and with a view to the adoption of whatever measures might be possible to remove such sources and to prevent their recurrence. The death rate from typhoid fever, which, during 1894, had been 85.8, dropped in 1895 to 79.3.

On May 19, 1896, an efficient law was enacted providing for the enforced drainage of lots, including the abolition of box privies. As was the case with respect to the milk law, so with respect to the compulsory drainage act, no special provision was made for its enforcement. During this year, however, 800 box privies were abolished. Twenty-six public wells were closed and the death rate from typhoid fever fell from 79.3 to 53.7. During the following year, 1897, 973 privies were abolished, and two public wells were closed; and the death rate during this period fell to 45.7. It must not be presumed, however, that the diminution in the death rate was due to the abolition of privies or the closing of wells. The possible effect of the restoration to use of the improved Dalecarlia reservoir on July 28, 1895, must also be borne in mind. And then as a factor calculated to offset any conclusions with respect to the cause of the diminution in the typhoid fever death rate are the facts that during the following year, 1898, the death rate rose to 67.5, that in 1899 it was 69.3, and in 1900, 74.5; and this notwithstanding the fact that during the years 1898, 1899, and 1900, 1429 box privies had been abolished and 49 wells closed, and, more efficient inspection having been provided for, 1402 inspections of dairy farms had been made.

On March 21, 1898, appeared a report issued by the Marine Hospital Service, showing the results of certain investigations which that organization had been making since the previous summer with reference to the pollution of the Potomac River. This report, prepared by Dr. J. J. Kinyoun, then Passed Assistant Surgeon, Marine Hospital Service, after presenting the facts that had been found, said: "The conclusion to be drawn from the above statements is that the Potomac is polluted with sewage to such an extent that it is a constant menace to the health of the inhabitants of the District of Columbia. This is not a new statement, but is made only to emphasize what is already well known." On June 30th, of the same year, largely as the result of the persistent agitation of the subject by the Medical Society, an appropriation was made for investigating the feasibility and propriety of filtering the public water supply of the District of Columbia. The result of these investigations was submitted by the officer in charge of the Washington Aqueduct, then Lieut.-Col. A. M. Miller, on March 28, 1900. Col. Miller reported that "the bacteriological results obtained showed that the Potomac water as delivered from the mains is, in times of turbidity and low temperature, dangerous to health by reason of the quantity of bacteria present," and concluded that "if Washington is to be supplied at all times with an unobjectionable water, the only recourse is the adoption of a system of filtration." Col. Miller recommended the adoption of mechanical filtration, to which recommendation the Medical Society and the community generally took exception and, as a result, the Senate Committee on the District of Columbia investigated the subject, taking the testimony of certain experts with respect to the relative merits of the two systems, and procuring a report from certain distinguished engineers concerning the matter. The report of the Senate Committee was submitted to the Senate on February 19, 1901, and, on March 1, of that year, the first appropriation was made for the construction of filters for the purification of the water supply of the District of Columbia.

On January 8, 1902, the Washington City reservoir was put into service. This was a new reservoir added to the water-supply system of the District, and had a capacity of three hundred million gallons. It added, therefore, materially to the period of sedimentation of the public water supply, at least in certain parts of the city. In 1901 and 1902, 560 privies had been abolished, five public wells closed, and 3,222 inspections of dairy farms made. On January 8, the Washington City reservoir had been put into service, and on February 4, the law requiring the reports of all cases of typhoid fever had been enacted. Yet the death rate, which had fallen in 1901 to 56.4, rose in 1902 to 74.0.

The following year, however, it fell to 45.0 and during the next year, 1904, it fell to 43.8. On August 18, 1905, the first of the public filters was put into use, and others were put into service as rapidly as completed, so that by October 5, the entire water supply of the city was filtered. It was too late in the year to expect that the filtration of the public water supply would bring about a material improvement in the death rate for the entire twelve-month period, yet the community was somewhat disappointed when no improvement occurred even during November and December. But with the filtration of the entire water supply of the city, with the abolition during 1903-04-05 of 968 more box privies, the closing of seven public wells, and 11,124 inspections of dairy farms, it was confidently believed that the year 1906 would show some improvement. What then was the disappointment of the community when month by month passed without any diminution in the number of cases reported or in the number of deaths? During the year 1906, 197 more privies were abolished, eleven more wells were closed and 3,526 inspections of dairy farms were made. Regulations were promulgated on April 4, 1906, for the better regulation of the keeping and disposal of stable manure with a view to the diminution of the number of flies and the lessening of the likelihood of infection through that agency, and on April 24, a regulation was promulgated requiring candy, and similar foods, sold on the streets and other similarly exposed places, to be kept covered so as to prevent them from becoming contaminated by dust and flies. Yet when the year had rolled around and an account of typhoid fever mortality was taken, it was found that the death rate, which in 1905 had been 43.9, in 1906 was 49.6.

The close of the year 1906 was marked by the discussion of the water supply of the District, on November 7, by the American Society of Civil Engineers, and by the publication on November 8 of a report on the subject by a special writer for the Engineering News, Mr. T. E. Horton. On February 16, of the current year, the Public Health and Marine Hospital Service published an elaborate report, concerning the prevalence of typhoid fever in the District of Columbia, and during the same period the Geological Survey has published an account of the Potomac River Basin, which goes exhaustively into the subject of stream pollution. It can not be said, however, that anything new with respect to the cause of the undue prevalence of typhoid fever has been developed.

From what has been said it will be seen that the Health Department of the District of Columbia has had an unusual opportunity for investigating the causes of typhoid fever during a considerable number of years past. Not only has a large number of cases of this disease come under the observation of the Department and been investigated by its own representatives, but there have been available for study the results of several more or less independent investigations. It may not be inappropriate, therefore, in concluding this paper, to state in a summary manner some of the results and conclusions.

1. *Variations in Death Rates.*—The variations in the typhoid fever death rate from year to year from unknown causes are so great as to render it unwise to found any opinion as to permanent improvement upon figures for a single year, but a single rise in the death rate may be sufficient to prove the continuous existence of danger, potential at least. (See Table I.)

2. *Distribution.*—No evidence has been found to show that typhoid fever has been persistently more prevalent in any one part of the District than elsewhere.

3. *Race.*—Whether typhoid fever is or is not more prevalent among the colored population has not been determined. The colored case rate is, as compared with the white case rate, relatively low, while the colored death rate and percentage of fatalities to cases are relatively high. This may be due either to the fact that mild cases among the colored race escape observation, or to the fact that when the disease occurs death is more apt to follow, or to both of these causes. (See Table II.)

4. *Milk Supply.*—A connection between the distribution of milk from certain dairy farms and the occurrence of typhoid fever has been found in 2.6 per cent of 4,135 cases of typhoid fever apparently indigenous to the District, investigated between 1902 and 1906, inclusive. No evidence has been found, however, to show that the general prevalence of typhoid fever in the District has been due to the milk supply, or that the number of cases in the District fairly chargeable to the milk supply exceeds the number chargeable to the same source in other communities. (See Table III.)

5. *Oysters and Vegetables.*—No evidence has ever been found upon which any case of typhoid fever could fairly be attributed to the eating in the District of Columbia, of infected oysters, clams, or uncooked vegetables, and no facts are at hand to show that the supply of these articles in the District of Columbia is materially different from the supply in other places where typhoid fever is not so prevalent.

6. *Privies.*—No demonstrable relation has been discovered between the location of box privies and the occurrence of typhoid fever. Whether the very considerable diminution in the number of box privies

within the sewered portions of the District has or has not anything to do with the diminution in the prevalence of typhoid fever that has occurred in recent years, can not be demonstrated. (See Table I.)

7. *Water Supply. Public Wells.*—In no instance has it been possible to trace any case of typhoid fever to a public well, nor has it been possible to discover any grouping of cases about any public well. Whether the closing of a large number of public wells has or has not contributed toward the diminution in the prevalence of typhoid fever in the District of Columbia, which has occurred since 1894, can not be demonstrated. In two cases outbreaks were fairly chargeable to the infection of private wells. (See Table I.)

Public Water Supply.—That prior to the filtration of the public water supply, typhoid fever could be distributed throughout the District of Columbia by the contamination of the Potomac River at a point even so remote from the intake of our city water supply as 174 miles, is believed to have been demonstrated by the unusual prevalence of typhoid fever in 1889 and 1890, coincident with an outbreak of typhoid fever at Cumberland, Maryland, and the unusual prevalence of the disease in September, 1904, immediately subsequent to an outbreak at Mount Savage, Maryland. The fact, however, that the water supply of the District has been, according to accepted standards, thoroughly well filtered since October 5, 1905, without any subsequent diminution in the prevalence of typhoid fever until June, 1907, shows either that the continuous undue prevalence of typhoid fever in the District of Columbia prior to filtration was not due to the public water supply, or that accepted ideas with respect to the operation of a slow sand filter in its specific relation to the typhoid bacillus are wrong, or that prevailing opinion as to the period that ordinarily elapses between the ingestion of the typhoid bacillus and the onset of the disease is erroneous.

The number of bacteria per cubic centimeter in the public water supply since filtration seems to bear no relation to the prevalence of typhoid fever, except that the number is, in a general way, larger during those periods when the disease is least prevalent than it is at other times. A similar relation existed prior to filtration. The exact relation existing between the frequency of the finding of colon bacilli and the occurrence of typhoid fever can not be made out definitely from data at present in hand. The unusually large number of cases reported during January of the current year considered in connection with the unusual frequency of the finding of colon bacilli in the water supply in November and December of the past year, and January of the current year, suggests a possible relation between those two factors. So also does the unusual freedom of the District from typhoid fever during the past summer, when examinations for colon bacilli were altogether negative, as compared with the prevalence of the disease during the summer of 1906 when colon bacilli were more frequently present. In undertaking to determine the relation between the finding of colon bacilli in the water supply and the occurrence of typhoid fever comparisons must be made only of such data as relate to corresponding seasonal periods. The fact that the amount of raw water ingested during the summer months is greater than during the cold season, renders the chance of infection through water, other things being equal, greater during hot weather. (See Tables IV & V.)

8. *Bacillus Carriers.*—Available evidence is not such as to justify the opinion that so-called bacillus carriers play an important role in the dissemination of the disease. Of 4,135 cases originating in the District of Columbia between 1902 and 1906, inclusive, only 7.3 per cent were charged to direct contact with known cases. Moreover, many of our typhoid fever patients must have been bacillus carriers for longer or shorter periods after they had recovered clinically and resumed their places in their respective households. Yet the occurrence of a second case of typhoid fever in the same house in which the first case occurred, but after the lapse of four or more weeks from the recovery of the first case, is of extreme rarity.

Although we are not able to point out the cause, yet there has been a great diminution in the prevalence of typhoid fever in the District of Columbia since, in 1894, agitation was begun for the sanitary improvement of the District of Columbia. Much still remains, however, to be done. To class such typhoid fever as now exists as "residual" typhoid or "prosodemic" typhoid avails us nothing. Nor is anything gained by attributing the undue prevalence of the disease to the fact that Washington is a "southern" city. Either typhoid fever is a preventable disease or it is not. If it is, let us prevent it. If it is not, let us say so and turn our attention to something where or efforts may bring some reward. Personally, I believe that all diseases are preventable even though we may not yet have found out how to prevent them, or, if we have found out, although we can not or will not pay the price of prevention.

The problem at hand is not one affecting Washington alone, or one affecting any other one of two communities. It is one affecting the entire country, which during the census year 1900 lost 35,379 of its people from this preventable cause. Let the United States then devote some of its millions to the study of the disease and to the dissemination of information with respect to it, so that the day of its eradication may be hastened. Let the government attack the problem of preventing diseases of human beings with the same earnestness and energy with which it has attacked the problem of preventing or curing diseases of the lower animals and of plants, in the same direct manner, and in the same liberal spirit, and in the end all will be well.

TYPHOID FEVER IN THE DISTRICT OF COLUMBIA.

Table I.— Showing what has been done to prevent typhoid fever, and the results.
(Cases and deaths from "typho-malarial" fever are included.)

Year	Inspection of dairy farms.	Public wells closed.	Privies abolished.	Typhoid Fever.				Remarks.
				Cases reported	Deaths.	Death rate per 100,000.	General death rate per 1,000.	
1889	......	......	172	.....	213	95.6	23.15	Mar. 2. Commission on sewerage authorized.
1890	......	......	119	.....	257	110.5	23.81	
1891	......	......	105	.....	195	80.4	25.16	Dr. Kober's report of the Cumberland outbreak.
1892	......	......	72	.....	217	85.8	25.36	
1893	......	......	188	.....	212	81.2	23.25	Mar. 3. Appropriation for improvement of Dalecarlia reservoir.
1894	......	39	546	.....	228	85.8	21.89	Feb. 5. Dr. Smart's address on water supply. June 6. Medical Society's report on typhoid fever. July 1. War Department's report on water supply, by Col. Elliot.
1895	......	47	375	.....	216	79.3	21.23	Mar. 2. Milk law enacted. July 28. Dalecarlia revervoir put into use. Dec. 2. Health Department report on typhoid fever, by Dr. Kober.
1896	......	26	800	.....	148	53.7	21.16	May. 19. Compulsory drainage act passed.
1897	......	2	973	.....	127	45.7	19.75	
1898	......	11	711	.....	191	67.5	20.54	Mar. 21. Marine Hospital report on water supply, by Dr. Kinyoun. June 30. Appropriation for investigating feasibility and propriety of filtration.
1899	596	38	381	.....	200	69.3	20.32	
1900	806	0	337	.....	219	74.5	20.61	March 28. War Department's report on water supply, by Col. Miller.
1901	957	5	280	.....	169	56.4	20.19	Feb. 19. Senate Committee's report on filtration. Mar. 1. Appropriation for filters.
1902	2265	0	280	1474	226	74.0	18.95	Jan. 8. Washington City reservoir put into service. Feb. 4. Law requiring reports of cases of typhoid fever enacted.
1903	3399	0	363	1055	140	45.0	19.09	
1904	4092	0	208	1006	139	43.8	19.61	
1905	3633	7	197	1097	142	43.9	19.20	Aug. 18. First filters put into service. Oct. 5. Entire water supply filtered.
1906	3526	11	197	1126	162	49.6	19.35	Apr. 4. Regulations governing keeping and disposal of manure. Apr. 24. Regulation promulgated requiring candy, etc., sold on streets to be covered. Nov. 7. American Society of Civil Engineers' discussion of water supply. Nov. 8. Engineering News' report on typhoid fever, by Mr. Horton.
1907	....	....	.....	.....	......	....	....	Feb. 16. Public Health and Marine Hospital Service report on typhoid fever. Mar. Geological Survey's report on the Potomac River Basin. May 21. All shallow wells ordered closed. May 31. Regulation promulgated, requiring stores to be screened. July 8 and 27. Nine shallow wells excepted from order of May 21.

TYPHOID FEVER IN THE DISTRICT OF COLUMBIA.

TABLE II.—Death rates per hundred thousand for white and for colored people from 1894 to 1906, inclusive.

(Deaths from "typho-malarial" fever are included.)

Death Rates.				Ratio white death rate to colored death rate.	
Year.	Whites.	Colored.	All.	From Typhoid Fever.	From All Diseases.
1894...	80.2	97.5	85.8	1 to 1.21	1 to 1.73
1895.............	67.5	104.4	79.8	1 to 1.55	1 to 1.61
1896.....	48.4	65.0	53.7	1 to 1.34	1 to 1.65
1897.......... ...	38.5	61.1	45.7	1 to 1.58	1 to 1.77
1898.............	52.1	100.9	67.5	1 to 1.94	1 to 1.69
1899.............	48.4	115.4	69.3	1 to 2.41	1 to 1.77
1900.............	64.0	97.8	74.5	1 to 1.53	1 to 1.72
1901.............	42.8	87.1	56.4	1 to 2.03	1 to 1.82
1902.............	71.5	79.7	74.0	1 to 1.11	1 to 1.86
1903.............	38.1	60.8	45.0	1 to 1.60	1 to 1.74
1904.............	35.5	63.4	43.8	1 to 1.79	1 to 1.78
1905.....	40.0	53.3	43.9	1 to 1.33	1 to 1.90
1906.............	35.4	84.2	49.6	1 to 2.38	1 to 1.86

DEATH RATES FOR 1905 IN STREETS AND ALLEYS, COMPARED.

	Whites.			Colored.		
	Streets.	Alleys.	Ratio.	Streets.	Alleys.	Ratio.
General death rate per 1,000..........	13.2	15.2	1 to 1.15	28.4	28.9	1 to 1.02
Typhoid fever death rate per 100,000.	39.8	57.5	1 to 1.44	55.7	42.0	1 to 0.75
Population...........................	225,689	1,739	....	79,036	16,659	....

TYPHOID FEVER IN THE DISTRICT OF COLUMBIA.

TABLE III.—Prevalence and cause before and after Filtration of Public Water Supply.

	1902[1] and 1903.	1904.	1905.[2]	1906.
Cases reported	2329	1006	1097	1126
Deaths reported	293	141	142	162
Per cent of fatal cases	12.58	14.02	12.94	14.39
Case histories obtained	1927	892	973	1092
Cases infected outside of District of Columbia	231	146	170	202
Cases of local origin	1696	746	803	890
Cause of cases of local origin:				
No. attributed to direct contact	140	56	55	51
No. attributed to milk	26	0	23	59
No. of unknown origin	1530	690	725	780
Per cent attributed to direct contact	8.26	7.51	6.85	5.73
Per cent attributed to milk	1.53	0.00	2.86	6.63
Per cent of unknown origin	90.21	92.49	90.29	87.64
Origin of drinking water used by local cases of unknown origin prior to onset of illness:				
Potomac water exclusively	1172	610	648	660
Potomac water in part	145	12	25	67
Well water	162	49	43	34
Spring water	27	18	8	9
Bottled waters	12	0	0	10
Melted ice	12	1	1	0
	1530	690	725*	780

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[1] Figures for "1902 and 1903" cover the period from the time when the law requiring cases of typhoid fever to be reported, enacted February 4, 1902, became practically operative, to the close of 1903.

[2] Entire public water supply, except well water, filtered since October 5, 1905.

TYPHOID FEVER IN THE DISTRICT OF COLUMBIA.

TABLE IV.—Relation between the number of bacteria in the public water supply and the prevalence of typhoid fever.

("Typho-malarial" cases and deaths are included.)

Date.		Bacteria per c. c.		Typhoid fever.		Date.		Bacteria per c. c.		Typhoid fever.	
		No. of observations.	Average count.	Cases reported.	Deaths.			No. of observations.	Average count.	Cases reported.	Deaths.
1886.	Samples of tap water.					1905.	Samples from clear water reservoir.				
Jan.		2	3,774	....	10	Nov.		25	27	30	14
Feb.		4	2,536	....	5	Dec.		26	60	51	67
Mar.		5	1,210	....	10	1906.					
Apr.		4	1,521	....	8	Jan.		27	39	27	6
May.		3	1,069	....	7	Feb.		24	16	21	4
June		2	348	....	5	Mar.		28	19	18	5
July		2	255	....	17	Apr.		25	22	35	4
Aug.		1	254	....	26	May		27	17	44	10
Sept.		2	178	.. ..	18	June		26	17	58	9
Oct.		3	75	....	16	July		24	26	181	21
Nov.		1	116	....	12	Aug.		28	14	293	32
Dec.		2	967	....	17	Sept.		23	14	150	20
1887.						Oct.		27	16	171	28
Jan.		3	882	....	4	Nov.		25	12	32	19
Feb.		....	....	....	4	Dec.		25	45	46	4
Mar.		....	....	....	7	1907.					
1899.						Jan.		28	68	53	7
July		14	67	....	10	Feb.		28	45	32	6
Aug.		15	269	....	39	Mar.		30	64	25	4
Sept.		26	221	....	30	Apr.		27	21	28	6
Oct.		25	137	....	28	May		25	26	37	7
Nov.		25	431	... .	29	June		25	18	36	2
Dec.		15	597	....	26	July		24	17	32	10
1900.						Aug.		31	17	191	18
Jan.		26	15,873	....	17	Sept.		27	32	187	17
Feb.		22	9,232	....	6						
Mar.		....	....	....	8						
Apr.		....	....	....	10						

TYPHOID FEVER IN THE DISTRICT OF COLUMBIA.

Table V.—Relation between the frequency of the finding of colon bacilli in the public water supply and the prevalence of typhoid fever.

("Typho-malarial" cases and deaths are included.)

Date.		Colon bacilli.		Typhoid fever.		Date.		Colon bacilli.		Typhoid fever.	
		No. of specimens examined.	Per cent containing colon bacilli[1]	Cases reported.	Deaths.			No. of specimens examined.	Per cent of 10 c. c. containing colon bacilli.	Cases reported.	Deaths.
1897.	Samples of tap water.					1906.	Samples from filtered water reservoir.				
July		....	80	....	10	Jan.		....	....	27	6
Aug.		....	33⅓	....	18	Feb.		24	0	21	4
Sept.		....	70	....	20	Mar.		27	0	18	5
Oct.		....	70	....	18	Apr.		25	4	35	4
Nov.		....	40	....	10	May		27	0	44	10
Dec.		....	20	....	18	June		26	0	60	9
1898.						July		21	5	184	21
Jan.		....	20	....	8	Aug.		27	4	295	32
Feb.		....	25	.. ..	4	Sept.		25	8	155	20
Mar.		....	....	....	2	Oct.		27	4	171	28
Apr.		... .	....	....	9	Nov.		25	8	82	19
						Dec.		24	8	46	4
						1907.					
						Jan.		26	12	53	7
						Feb.		23	0	32	6
						Mar.		26	0	25	4
						Apr.		26	4	28	6
						May		26	0	37	7
						June		25	0	36	2
						July		26	0	82	10
						Aug.		27	0	191	18
						Sept.		25	4	188	17

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[1] The record does not disclose the size of the sample examined.

REFLEX NEUROSES WITH PARTICULAR REFERENCE TO EYE-STRAIN.*

By D. KERFOOT SHUTE, A.B., M.D.,

Professor of Anatomy and of Clinical Ophthalmology.

Reflex action plays a part of fundamental importance in physiology. It is also of very wide prevalence in the production and fixation, first, of abnormal physiological states, and, secondly, of morbid anatomical conditions. We are aware of the fact that often in the past and too often in the present, specialists in the various branches of medicine have unduly and unwarrantably, accounted for distant pathological conditions exclusively through abnormal states prevailing in the domain of their several specialties. The tendency of the present day is to permit the reflex pendulum to swing too far in the opposite direction and to ignore too greatly the extreme importance of reflex action in the production of pathological conditions.

In the female disturbance of the auditory centers is not uncommon in ovarian and other internal disorders.

The relation between aural and ocular derangements has recently been emphasized by Cleveland and Oliver and many of these relations are clearly reflex in character. The trifacial nerve supplies many filaments not only to the eye but also to the middle ear and in the latter location a close association exists between the sympathetic and cranial nerves. As a result morbid conditions of the eye may, by reflex actions, so interfere with the trophic conditions of the middle ear as to induce not only functional disturbances but even organic changes in the tissues.

It has been proved that dental caries may, by reflex action, produce not only a functional disturbance of the organ of hearing, but also an acute inflammation of the middle ear. The so-called "sympathy" between the ear of one side and that of the other, which was recognized long ago by Wharton Jones, Kramer and other writers, is the result of the reflex action of a diseased ear upon the other ear. This reflex action from one ear to the other leads at first to functional disturbance and then to atrophy. While in many cases it is dependent upon the decussation of the auditory fibers, it is also brought about by the associations of the auditory and sympathetic nerves. Recently Urbantochitz has extensively investigated and written upon this subject. Aurists of experience tell us that inflammations of the middle ear have been caused by dentition. In children particularly a reflex otalgia occurs depending upon the eruption of molars or upon early dental caries. Dench in his work upon "Diseases of the Ear" says that a pathological condition in any portion of the body may produce within the organ of hearing not only alterations of function, but also certain visible changes. A ready anatomical and physiological explanation is that through a reflex stimulus from a distant part changes take place in the vascular supply through the action of the vasomotor nerves and that the aural phenomena are developed on account of capillary dilatation. As illustrations we may refer to the giddiness frequently encountered in disorders of digestion and due to the fact that the nucleus of the vagus lies so closely to the center of the vestibular nerve. In like manner may be explained transient attacks of impairment of hearing accompanied by subjective noises of an intense character due to the fact that the center of the vagus in the medulla oblongata lies very close to the nucleus of the cochlear nerve. Aurists teach us that tinnitus is of common occurrence as the result of a pathological condition of the pelvic viscera, of subacute gastritis, of constipation, etc. Likewise a moderate impairment of hearing may be due to visceral disturbances, particularly of the pelvic viscera. Aurists of large experience tell us that a reflex stimulus may cause so great a transudation of serum or blood within the tympanum as to cause a rupture of the membrana tympani; also that herpes occurs on the auricle as a result of reflex action. Hypersensitive areas may occur as the result of reflex action, in an otherwise normal external auditory meatus. A group of symptoms of rare occurrence is noted by aurists known as angioneurotic edema and which is entirely of reflex origin. This edema is accompanied by exquisite pain and tenderness. Should the angioneurotic edema accompany a simple and otherwise uncomplicated acute middle ear inflammation it would constitute a pseudo-mastoid disease and might easily lead to the diagnosis of true mastoid disease, and the performance of a useless surgical operation. Dench states that all reflex aural disturbances, particularly those of a painful character, are most frequently met with in females of a neurotic or hysterical type. So much for the testimony of aurists as to the importance of reflex action in inducing functional and organic diseases of the ear.

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* Paper read by invitation, before the "National Association of Pension Examining Surgeons," in Washington, D. C., in May, 1907.

Rotch, in his work on Pediatrics, says that the twitching and a certain amount of discomfort and fever which occur in children, at the time when a tooth is the apparent cause, should be referred to as a significant illustration of nervous phenomena from reflex causes. He says further that convulsions of a reflex nature occur at this time, and cease when the tooth has assumed its place above the margin of the gum. The rythmical oscillation of the eye-balls known as nystagmus occurs occasionally as a congenital disease and may persist throughout life. Sometimes it is dependent upon organic disease of the brain, such as meningitis and hydrocephalus, multiple sclerosis, cerebellar abscess and tumor, and again may arise from local diseases of the eye. In many cases this condition is induced reflexly from various peripheral stimuli and is not, according to Rotch, a very uncommon symptom in young children. He states that he has notes of two cases, brothers, who during the dental period showed this oscillation of the eyeballs with no other symptoms. He states further that gyrospasm (rotary movements of the head) and spasmus nutans (nodding) are peculiar movements of the head in young children which are apparently of a reflex origin and are at times associated with nystagmus and strabismus. He states further that the chief causes are idiocy, rachitis, gastro-enteric irritation, and dentition. Nothing illustrates more forcibly the reaction of medical thought and practice, than the attitude of the medical profession towards gum-lancing. It was erroneously believed in former times that almost every disease which occurred in early life was due to dentition and gum-lancing was practised indiscriminately. Now at the present time, an almost equal amount of indiscrimination is displayed in refusing to do any gum-lancing at all. There are well-defined and indisputable clinical facts that positively demonstrate the value of gum-lancing in certain judiciously selected cases, and by this gum-lancing certain very grave reflex symptoms are immediately relieved. No ophthalmologist has ever claimed the indiscriminate influence of eye-strain over other portions of the body that the older pediatricists claimed for dentition over all the ills of childhood. Not even that much misrepresented and misunderstood, though level-headed and distinguished ophthalmologist, Dr. George M. Gould, has made a tithe of the claims for eye-strain that the older writers on the diseases of children made for dentition, and which the medical public so gullibly accepted, while now they so irrationally reject so large a part of the extremely valuable teachings of Dr. Gould. I am profoundly convinced, from fifteen years' practice in ophthalmology, that if the general practitioners would give heed to the invaluable teachings of Dr. Gould, untold suffering would be banished from thousands and thousands of people. The writer is convinced that the reflex ocular neuroses are much more extensive and important than the general practitioner is aware of and he has therefore thought that it might prove interesting as well as instructive to present the subject to this distinguished body in a brief and conservative manner. All physicians are aware of the fact that eye-strain will produce severe headache for instance, but many are not aware of the fact that there are many other serious results that follow eye-strain, such as insomnia, petit chorea in children, vertigo, stomach derangements, impaired general nutrition, etc.

Slight errors of refraction, frequently dating from birth, often have a gradual injurious influence upon the nervous system, similar to the dropping of water upon a stone. The incessant impacts of reflex irritations upon the nerve-centers from any organ—eye, ear, ovary, tooth, or what not—often lead to the over-leaping or shunting of these irritations to neighboring or more remote nerve-centers; and we thus have a perfectly rational anatomical and physiological basis for many otherwise obscure reflex neuroses. When these reflex irritations are constantly occurring in persons of sensitive, highly-strung temperament, the wonder is, not that reflex neuroses occur, but that they are not more frequent. As a matter of fact these reflex neuroses are much more common than is generally supposed.

Eye-strain, productive of reflex neuroses, is of two types, viz., (1) Accommodative (due to ametropia or anisometropia) where the intrinsic ocular muscle—the ciliary muscle—is attempting to overcome low grades of astigmatism, hypermetropia, etc. (2) Muscular (due to heterophoria) where the extrinsic ocular muscles are in a condition of imbalance.

Probably in the great majority of cases this imbalance of the extrinsic ocular muscles is due to the low grade errors of refraction. At the beginning it is very important to emphasize strongly the fact that eye-strain is very commonly the cause of serious reflex neuroses, in children and adults alike, when no complaint is made whatever about the eyes, and when vision both for distance and near objects is perfect. Many physicians think that, because a patient has a vision for distance which is 20/20 (6/6) or can read easily Jaeger type No. 1, at 33 centimeters (13 inches), he has normal eyes. It cannot be emphasized too strongly that this is a very serious error. Moreover, under the above circumstances even a trained ophthalmologist can never be certain that a person under 45 years of age has normal eyes without the use of a cycloplegic. While many people suffer greatly from small errors of refraction, and from muscular imbalance, there are others who have no bad effects whatever. A sufficient explanation for this exists in the difference of general health, vocation, temperament, and environment in different individuals.

The reason that low grade errors of refraction cause so much trouble while high grade errors commonly do not is because, in the former cases, the ciliary muscle, by unequal and irregular contractions, can overcome the effects of the refractive error and so cause eye-strain, but in the high refractive errors a compensating irregular contraction of the ciliary muscle cannot occur—hence the absence of eye-strain in the latter cases.

An extremely interesting group of reflex ocular neuroses are those where we find nervous or sick headache and general nervous symptoms, such as insomnia, irritability of temper, nausea, vomiting, facial chorea in children, etc., and constituting a symptom complex which can be entirely relieved by the correction of an error of refraction which throughout life had been the unsuspected cause of much suffering.

There are other cases in which the ocular defect leads to a tense post-ocular pain shooting back to the occiput and nape of the neck, and down the spine, even radiating to the shoulders and arms. There are other cases recorded by skilled and experienced ophthalmologists where great pain in the region of the heart, and which caused great anxiety, was entirely relieved by correcting an astigmatism against the rule and by a tenotomy for a hyperphoria (Risley). Many patients ascribe their symptoms to hunger, biliousness, and overfatigue, heredity and many other things, except the true cause, viz., eye-strain. One of the most striking things in ophthalmology is the constant handing down from parent to child of compound hypermetropic astigmatism with, therefore, headaches which are supposed to be hereditary and incurable, where a pair of glasses would entirely cure the headache and accompanying reflex neuroses. Many cases like the following occur in the literature of ophthalmology. A professional man (physician) suffered from almost constant occipital pain, was in despair on account of insomnia, considered himself a chronic dyspeptic, and for many years was in constant terror because of his insomnia, and premonitions of impending calamity. He had consulted many colleagues in different cities without lasting relief. He was finally advised to take a long sea voyage on a slow sailing merchantman. He had left home a "nervous wreck" and had returned after six months much improved in many ways. But as soon as he entered upon his work as a rhinologist all of his old symptoms speedily returned. He had normal acuity of vision and no subjective ocular symptoms. There was a low grade of astigmatism, a tendency for the two eyes to converge, and a tendency of the right eye to deviate upwards. As soon as the refractive error was corrected by glasses, and the vertical deviation of the right eye relieved by an operation, all of his symptoms promptly vanished, not only the headache and insomnia, but also the dyspepsia. He ate with impunity, the morning following the operation, a hearty breakfast of sausage, buckwheat cakes, and coffee, and continued with impunity to eat anything he desired for years afterwards. His general health improved and he continued his work ever since with entire comfort (Risley).

Not only is insomnia caused by eye-strain, but also the very contrary condition such as great drowsiness.

The cause of what the English call "Academy headache" (sightseers headache") has been attributed by Simeon Snell of Edinburgh to throwing the gaze above the horizontal line, especially without a corresponding uplifting of the head, thus straining the elevators of the eyes. Any one watching visitors to a picture gallery will observe how often the eyes must be turned upwards to see the pictures that are hung above the level of the head. Certain cyclists suffer from this Academy headache when they lean on the handle bars with the head or what not—often lead to the over-leaping or shunting of these irritations to neighboring or more remote nerve-centers; and we thus have a perfectly rational anatomical and physiological basis for many otherwise obscure reflex neuroses. When these reflex irritations are constantly occurring in persons of sensitive, highly-strung temperament, the wonder is, not that reflex neuroses occur, but that they are not more frequent. As a matter of fact these reflex neuroses are much more common than is generally supposed.

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Dr. Gould has written most instructively and entertainingly upon the optic and ocular factors in the etiology of the scoliosis of school children. He has shown conclusively that astigmatic children with unsymmetric oblique axes (especially in the dominant eye) develop a compensatory curvature of the spine on account of the habitual lateral inclination of the head. This physiological sciosis may readily degenerate into a pathological and organic spinal curvature. It seems to the present writer overwhelmingly reasonable that orthopedic surgeons in these cases should be careful to eliminate the factor of eye-strain.

The use of emmetropic eyes under improper physical posture, unhygienic conditions of light, unusual direction of line of fixation, will cause asthenopia (painful sight), and reflex neuroses in healthy individuals; how much more, therefore, will abuse of the eyes produce reflex neuroses in those who are infirm from any cause or who have ametropia!

There are a number of able, successful and widely experienced ophthalmologists who teach that true chorea and true epilepsy may, under certain circumstances, be made worse by eye-strain, and may even at times be developed by this factor. I will not enter upon the controversy now or quote the authorities for and against the proposition. The last word has by no means been said upon the subject. Any widely experienced ophthalmologist will tell you that he has seen epileptiform convulsions and choreic movements abolished by the relief of eye-strain. All that the conservative opthalmologist advises is that when you have to deal with obscure nervous affections, with epileptiform convulsions, various choreic movements, " habit chorea ", vertigo, nausea and vomiting, pain over the mastoid region (pseudo-mastoid disease at times), pain in the right inguinal region (possibly pseudo-appendicitis), obscure pains over the heart, torticollis and spinal curvature, migraine, hysteria, neurosthenia, apparently stupid children, incorrigible children and adults, insomnia, great irritability, extreme depression, impaired memory, difficulty of concentration of thought, apprehension, lack of self-confidence, exhaustion and weariness, and the like, as well as headache, it may well be worth your while to eliminate the factor of eye-strain. No harm can possibly be done, and on the other hand every good may be accomplished. As Gould has so ably and brilliantly insisted, eye-strain is a factor of tremendous importance in modern civilization. It will well repay you as general practitioners to read his delightful Biographic Clinics. In my judgment, and from my experience, they teach vastly more that is true than is erroneous. In my judgment Gould has done a vitally important work in reviewing the earlier writings of Thompson and Weir Mitchell, and insisting upon their great importance, and he has done an immense idamount of first class work himself by his scholarly and able writings. When a child is removed from school on account of physical or mental disability, when the professional man is taken from his books and his work, when the skilled artisan must abandon his duties on account of disabilities, when the literary man and woman are unable to continue their chosen activities, it is all very well to insist upon the importance of rest, out-door exercise, recreation, change of scene, and climate, tonics, massage, and such like—they are all of great value. But they will not cure reflex neuroses due to eye-strain. Discriminating students of biography and experienced ophthalmologists know that when these persons resume their routine duties and vocations only too often the old distressing complex symptoms return. They know also that frequently in these persons eye-strain is found when it is looked for, and complete relief frequently follows the correction of an error of refraction or a muscular imbalance. The eyes are so extremely complex, they are so intimately related to the central nervous system (the retina is actually a portion of the brain), each eye is supplied by five out of the twelve cranial nerves not to mention the sympathetic nerves, they are so absolutely essential not only to the well being and happiness but even to the life of the individual, they are so increasingly being used, in our comparatively brief modern civilization, for near work of increasing difficulty, whereas for ages and ages before, they were mostly used for distant observation, that it is incomprehensible to me why they should be so wantonly abused and non-safeguarded.

Every child on entering school ought to have its eyes examined carefully under a cycloplegic. Every person wearing glasses ought to have the eyes examined every year or two. Every person developing symptoms which may possibly be of a reflex character referable to the eye, would be better treated by eliminating the possibility of eye-strain. Nor would I have it understood for a moment that I am endeavoring to put the eye upon a pedestal of exclusive importance from the point of view of reflex neuroses. Reflex neuroses occur from many other portions of the body when diseased as I have indicated in the earlier portion of this paper. The writer is simply an ophthalmologist and for this reason he deliberately chose for the earlier part of this paper illustrations of reflex neuroses from Otology and Pediatrics. In this paper he has simply wished, as an ophthalmologist speaking to general practitioners to emphasize the very great importance that he attaches, from his reading and his personal experience, to eye-strain as an important factor in many painful and distressing and often obscure reflex neuroses.

HOSPITALS AND ASYLUMS OF EUROPE.

By WILLIAM A. WHITE, M.D.,

Professor of Mental Diseases, Superintendent Government Hospital for the Insane.

During the past two summers I have taken my vacation trip abroad, and on each trip have taken occasion to visit a number of hospitals, particularly hospitals for the insane, and these latter I inspected as thoroughly as the circumstances and the time at my disposal permitted. During the summer of 1906 I visited in all twenty-four hospitals, viz:

In or near Paris I visited La Bicêtre, La Salpêtrière, Bourneville's Institution for Feeble-Minded Children, the asylum at St. Ann, and the asylums at Villejuif and Charenton.

In Belgium I visited the Colony for the Insane at Gheel.

In the German Empire I visited the Provincial Asylum at Bonn, the asylums at Heidelberg, Frankfurt, Giessen, the Psychiatric Clinic at Munich, and the new asylum near Munich, Eglefing. Near Berlin I visited Hertzberg, the Institution for Epileptics, Wuhlgarten, the new institution now building at Buch, and the new Tuberculosis Hospital at Buch. At Vienna I visited the General Hospital (Allgemeines Krankenhaus), and the Asylum. At Prague I visited the General Hospital (Allgemeines Krankenhaus) and the Psychiatric Clinic.

In London I visited the Bethlehem Hospital, the Claybury County Asylum, and Guy's Hospital.

In regard to all of these institutions I may say that the problem of insanity is very much the same the world over, and has been solved in general in the same way. The institutions of the different countries differ largely in matters of detail, which of course are more or less dependent upon purely local conditions. In none of the institutions, however, did I see evidences of the amount of liberty which is so conspicuously a feature of the American hospitals. For instance, they were all surrounded by walls, and seemed to adhere very strictly to distinct rules as regards hours of visitation, etc., there being apparently very little effort made to accommodate friends or relatives at other times.

In all of the institutions except those in France there is the single-headed management. In France, however, there is a business head of the institution, and I must say that these hospitals appeared to be among the least well conducted of any that I saw. The medical director oftentimes either lives away from the hospital or spends but a small portion of his time there, the several medical services being to all intents and purposes separate institutions and having little organic connection.

In the French institutions I saw some evidences of mechanical restraint, although at St. Ann the physician with whom I made rounds, Doctor Simon, told me they used absolutely no restraint whatever. This is very commendable, as it is the central receiving hospital for Paris, and Doctor Simon told me that they had 2,000 admissions per annum on the female side alone. In France, however, as on the Continent generally, many patients are sent to hospitals for the insane who perhaps would not be in this country. There are no tedious legal formalities required for commitment, and patients generally who show mental symptoms are sent to the asylum. This includes each year quite a considerable number of cases of alcoholism.

In Germany there is a great deal of activity along psychiatric lines, and considerable progress is shown in the problems of construction of German institutions. It is noticeable that in practically none of the hospitals abroad are the buildings over two stories in height, whereas in this country we have only recently come to realize the desirability of putting up two-story buildings. They have evidently been building their hospitals two stories high for a long time. The old Bicêtre and the Salpêtrière have no buildings higher, while the general hospitals in Vienna and in Prague are of the same two-story construction. This maintains in practically all of the institutions that I saw throughout Germany.

The German institutions are all well built, although some of them now are getting rather old. They are all approximately the same size, accommodating from twelve to fifteen hundred patients. The Germans seem to think that larger institutions are not desirable, and when their institutions become crowded instead of adding buildings to already established hospitals they build new institutions. This results in giving a finished appearance to each hospital and it does not become necessary for a superintendent to be everlastingly endeavoring to remodel his institution to accommodate a constantly increasing population. The new institutions in Germany, however, are most exquisitely built, apparently almost regardless of cost. The Psychiatric Clinic at Munich was built by the University, and is intended to accommodate only 120 beds, and cost 2,000,000 marks, ($500,000). That is $4,000 per bed. The institution now building at Buch is to accommodate 1,000 patients, and to cost when completed 13,000,000 marks. This is something over $2,000 per bed, which, considering the cheapness of labor and the general cheaper cost of construction in Germany, is to say the least a very liberal allowance as compared, for instance, with the Government Hospital, the new extension of which cost less than $1,500 per bed. This institution is composed of two classes of buildings—large buildings for the more strictly chronic and custodial class of insane accommodating about 100 beds each, and smaller cottages accommodating 25 to 30 patients. There are also accommodations for the criminal insane, for there, as elsewhere, there appeared to be no institution for criminal insane, each hospital taking care of the criminals in its district.

The great care that is shown in details of construction is well illustrated in the building of the wall about this hospital. All of the large hospital buildings are built in the form of a rectangle, the wall merely connecting the buildings. This makes it only necessary to construct a sufficient amount of wall to occupy the space between the buildings, the ends of the buildings themselves filling in the interval. Besides this the ground is graded away from the foot of the wall for a considerable distance, so that a little way off the wall itself is hardly noticeable. This method of construction has been still more fully carried out at the new asylum (Mauer-Oehling) just outside of Vienna, which unfortunately I did not have time to visit. Here the ground is graded both inside and outside so that the wall itself merely sets in a depression, its top being on a level with the ground on each side. Hedges are then planted along on each side, making the wall quite invisible from within or without.

The new institution near Munich, Egelfing, is perhaps the most beautiful and the most complete in structural detail of any of the Continental hospitals for the insane. It was built to accommodate 1,200 patients, and they have almost that number there now, and cost between 8,000,000 and 9,000,000 marks, or in the neighborhood of $1,700 or $1,800 per bed. This is a beautifully situated hospital in the center of an immense valley of excellent farming land, and consists of about 60 buildings entirely upon the cottage plan, small cottages built to accommodate anywhere from 25 to 40 patients. They are all completely equipped in every detail and the architecture is of an extremely pleasing type. Practically everything has been done to make this institution complete in every detail. All the cottages are connected by a complete system of tunnels, and the most thorough sanitary provisions have been installed throughout.

At the asylum at Heidelberg I was particularly struck on entering to see a class of army surgeons assembling for a lecture on psychiatry. It is true that since the establishment in Washington of the Army and Navy Medical Schools that the students have been sent to the Government Hospital for the Insane to attend the course of lectures on psychiatry given there each year. The instruction of the army and navy surgeons abroad, however, along psychiatric lines is much more thorough than in this country. Surgeons are detailed from the service to serve as assistants in the various hospitals for the insane and in that way gain an experience impossible to get in any other way. Actual contact with the insane is absolutely essential to the understanding of their condition, and, aside from its general educational advantages it should be fostered, for by this means alone can the enlistment of mental defectives be reduced to a minimum. This matter is appreciated abroad as instanced by several papers on the subject that have recently appeared in the foreign literature. The men thus detailed to the hospitals for the insane often do excellent work and I have met them in the laboratories and clinics and noted their names on the programs of scientific meetings. We would do well to follow the suggestion of the European countries in this matter.

In both Buch and Egelfing the isolation room is largely used and most admirably constructed. The windows are either located out of reach of the patient or else are made of heavy glass in small panes set in steel sashes, so that the room can be thoroughly lighted, and yet there be very little possibility of a patient being able to obtain broken glass with which to injure himself. In some institutions, too, especially in the Psychiatric Clinic at Munich, I found all of the telephones, electric-light fixtures, water-faucets, and apparatus for raising and lowering transoms located within cupboards set in the wall and inclosed in a steel frame fitted flush to the surface, and painted the same color as the wall. They were practically unnoticeable.

In Germany I found pretty generally in use the so-called continuous-bath (Dauerbad). This is used for the treatment of the disturbed class of insane. I had for some time contemplated installing this system at the Government Hospital, but desired to see it in use abroad first if possible. This I have now seen, and two continuous-bath rooms have since been equipped and put in operation at the Government Hospital. It is to be hoped that it will go a considerable way toward solving the problem of the proper care of the most disturbed class of cases.

The institutions in the Austrian Empire that I visited are all very old. The Psychiatric Clinic at Prague, which is a portion of the General Asylum, the physician in charge told me, was 75 years old, and some of the other buildings connected with the institution were older yet. This clinic was in a greatly overcrowded condition, and it was apparently almost impossible to give proper care to the patients, and yet from this clinic, under the direction of Dr. Arnold Pick, there issues some of the best psychiatric work on the Continent. I saw here, as also in Vienna, the so-called "gitter" bed, which I was told was entirely an Austrian product. This bed is made by extending the iron posts at each corner about 4 feet above the bed and then surrounding them on all sides and above by a heavy rope net. Patients who are disturbed, or are disposed to get out of bed and run around the ward or make trouble in any way, are placed within this inclosure, one side of which is used as a door, being locked in place so that they cannot get out. The doctor told me that he did not at all approve of this arrangement, but that it was made necessary by the overcrowded condition of the hospital and by lack of a sufficient number of nurses.

I spent a most delightful afternoon at Gheel, about half an hour from Antwerp, where the colony system has been in vogue for so many years. This institution extends its jurisdiction over many square miles of surrounding country. This country is inhabited by a simple peasant class, whose sole occupation is tilling the fields. The hospital receives only the quieter class of patients, whom it is presumed are suitable for colonizing, although it has a central hospital building where patients can be taken care of provided the become temporarily disturbed or are ill. Arrangements are made by the hospital authorities with the peasant families to take one or two patients for which they are paid a nominal compensation, receiving their main return in the work which the patient is able to do. I visited several houses where patients were cared for in this way. In every instance the houses were scrupulously clean and severely simple. The patient's room was about the same in each instance, very small, perhaps 10 or 12 feet long by 7 or 8 feet wide, containing a single bed, a wash-stand, and a chair. A plain wooden floor, with perhaps a home-made rug by the side of the bed, whitewashed walls, with a crucifix at the head of the bed. The patient assists in the general household work, in looking after the cows, and whatever his strength and intelligence may enable him to do, and each year the hospital issues a diploma to the family who has taken the best care of their patient. These diplomas are very highly prized, and one was shown to me with a great deal of pride. Throughout the territory in which patients are cared for in this way, there are located here or there central bath houses to which all the patients in the near territory go for a bath. The doctors, unless in case of illness, are required to see each patient once a month. In each house a little book is kept where the doctor registers the time of his visit, and also takes the weight of the patient; this latter is done as an index to determine whether the patient is being properly fed or not. The superintendent thinks that 75 per cent of the insane could be cared for in this way. This is perhaps true in such a population as Gheel. This little village is many hundreds of years old, and even now consists only of one little, narrow, crooked street, with peasant houses scattered here and there, occupied by people whose parents and grandparents for generations before have lived there and done the same work. The population is fixed, crystalized, but the experiment which has been so successful there could hardly be applied in this country with its much more restless and ever-shifting people.

The hospitals in England are very much more like our home institutions than any others I saw. The one at Claybury is beautifully situated and throughout has an air of comfort with homelike surroundings that was very agreeable. In English institutions, too, they are much more liberal with the employees and pay them more nearly the rate of wages paid in this country. At Bethlehem, for instance, the female attendants get 60 pounds sterling per annum ($300.00). Employees in these institutions, too, seem to be on the whole a very good class. The Continental hospitals, however, seem to have drawn from a less intelligent body for their nurses. On the Continent, the wages paid are much smaller and the privileges granted are less. This is of course partly due to the greater buying value of money on the Continent.

At Wuhlgarten I found that the employees work twelve to fifteen hours a day, have eight days annual leave, and after they have worked for some considerable time, perhaps two or three years, a male attendant receives as a maximum wage 80 marks ($20.00) per month.

At the institution at Claybury, in England, I saw for the first time a thoroughly constructed so-called padded room. This is made by letting into the floor and the walls for about 7 feet up panels constructed of very heavy rubber, that offers about the same resistance to pressure that a moderately inflated rubber tire does. The joints are made so perfect that the room can be kept absolutely clean, in fact the hose can be turned into it, and if for any reason it is desirable these various panels can one or all be removed. The authorities at the hospital spoke in the highest terms of the advantages of these rooms. A disturbed patient who is liable to thrash about, perhaps fall out of bed or roll about on the floor and hurt himself against walls, is simply placed in this room, with a mattress, pillows, and bed-clothing being provided. He can then thrash about at will and there is little danger of his hurting himself. Windows are placed high in the room, perhaps 10 feet above the floor, so that they are out of reach of the patient. This method of construction has been in vogue for a long time in England, but it has never been adopted to any extent in this country.

As regards the method of commitment, I found nowhere any such method employed as is now in use in the District of Columbia, and against which I have been contending ever since I have been in Washington. In every country I visited the insane are practically sent to the asylum with about as little formality as they are sent to the general hospitals, and in no place that I visited was there anything remotely resembling a jury trial, except in England a jury trial is had, but only when it becomes necessary to appoint a guardian or committee. The commitment is made in England directly by the court. There are several methods but it amounts in general to the court signing the commitment upon satisfactory evidence and upon the examination of physicians. In Germany very often there is no medical examination made. Patients are sent directly to the hospital and the hospital authorities are trusted to keep them or not, as may be necessary. In rare instances a case may be brought before the court for decision, in which instance the court, consisting of its several justices, but having no jury, instead of summoning the patient before it goes to the hospital and sits there and takes evidence. This practically is an almost unheard-of procedure though, it is so rare.

Usually if a patient has a complaint to make, it is referred to the director (superintendent), and if his decision is not satisfactory it may be referred to the medical officer who is appointed by the Government to inspect institutions, and his decision is final. I can repeat what I have many times said in the past, and from a wider experience, that the District of Columbia stands almost alone in the civilized world in its atrocious method of committing the insane.

During the past summer my main objective point was Amsterdam, where I had the extreme pleasure of attending the International Congress on Psychiatry, Neurology, Psychology, and the Nursing of Lunatics. On my way to the Congress and afterwards during the short trip through southern Europe I took occasion to visit a number of institutions. I visited in all eight hospitals as follows:

In Belgium, St. John's Hospital at Bruges.

In Holland, Endegeest and Rhijngeest near Amsterdam.

In Italy, the new hospital for the insane at Padua, the Psychiatric Clinic and the Asylum at Florence, and the asylums at Rome and Naples.

St. John's Hospital at Bruges has no special features of interest from the hospital standpoint. It is one of those simple, homely, European institutions in which the Sisters minister to the sick. It presents nevertheless a great attraction to the tourist in the large collection of truly remarkable paintings by that wonderful early master in oils, Memling.

The Endegeest and Rhijngeest Hospitals are delightfully located in the country district a few minutes ride from Amsterdam. The former is for the insane. Its construction and equipment are very simple but the physician who showed us through had a broad grasp of psychiatric subjects, had studied in Germany and we found him strong in praise of the continuous-bath with which the hospital was fully equipped. On the grounds of the asylum is the house in which Descartes used to live and write—and a hundred feet or so in front of it a small monument erected to his memory.

The Rhijngeest hospital only a few moments drive from Endegeest is for neurological cases and is built more on the plan of a private sanitarium. It is here that Dr. Jelgersma, who is medical director of both institutions, and was the President of the Congress, has his laboratory. The laboratory is finely equipped and has a full force of assistants. Most excellent work is being done here, Dr. Jelgersma being a man of no ordinary abilities in research work along the lines of neuropathology.

At Padua we saw what is probably the newest of the Italian hospitals for the insane. In fact it was not yet finished and is only partly occupied. There were no features of special interest about the institution. It is a well built, attractive looking hospital, constructed along modern lines on the pavilion system. It is situated on a large tract of land just out of Padua, being reached by a short and very pleasant drive. I inquired into the cost of the institution and although my memory does not serve me as to the exact figures, I am sure it was over $1,000.00 per bed and I feel quite sure it was nearly $2,000.00. Notwithstanding the fact that this figure includes the price of the land it seemed to me a tremendous price to pay in a country where one is surrounded on all sides by evidences of the most abject poverty. In this part of Italy the people are much more prosperous, however, than they are further south.

At Florence I found one of the most modern equipments in Europe. Here the psychiatric clinic is located on the grounds of the asylum. All suspected insane persons are sent to the clinic first and from there without additional formality are transferred to the asylum if their condition warrants it. Many are kept, however, for a considerable time and are discharged recovered without having to be sent to the asylum. The process necessary to send patients to the clinic, however, amounts to a commitment, so that the authorities have full power either to retain them there or transfer them to the asylum.

The clinic although built in 1884 contains practically all of the features embodied in more modern constructions. There is a central administrative department flanked on either side by the wings for male and female patients. These two wings open centrally into a large lecture room much as they do in the clinic at Munich. Professor Tanzi, who occupies the chair of psychiatry in the University, is the director of the clinic and delivers his lectures here. He is perhaps the most prominent of the Italian psychiatrists and it is noteworthy that he perhaps is also the most Kraepelinian.

In addition to the lectures here the clinic is provided with a large library, and well equipped laboratories for neuro-pathology and psychology. There are four assistants constantly at work here and they appear to be doing a great deal of most excellent work. The first assistant, Dr. Rossi, is a man of wide scientific attainments who has already published much valuable work.

The manicomio (insane asylum) at Rome was the next one to be visited. Our visit here was in many respects a most remarkable experience. The main entrance to the hospital is in a dirty, narrow little street, the front doorway opening through a high, forbidding looking wall that seems to reach an interminable distance in every direction. On passing this doorway one enters a small reception hall from which a flight of marble steps leads up to a large corridor. After reaching this corridor one follows it for several hundred feet as it winds up a steep hill and finally opens on the remains of old gardens that were at one time private property. In fact the house that used to be occupied by the owner of this magnificent site is now used as a ward for some of the better class of patients. Following the winding paths of the gardens still further to the top of the hill I realized for the first time that I had mounted to an eminence overlooking the city for there at our feet was the magnificent panorama of Rome. Directly in front of us was the Vatican, the windows of the Pope's chambers, touchingly referred to by the doctor as the "poor captive," directly facing us.

As to the hospital itself there is little to be said in its praise except that it has a well equipped laboratory which showed evidences of being put to good use. The first assistant, Dr. Bonfigli, who very courteously conducted us through the hospital, appeared himself to be greatly interested in this side of the work and showed us a number of most interesting and instructive sections from work that he was engaged in.

The care of the patients appeared to be most deplorable in every way. This was especially noticeable in the disturbed wards for men. I have been living in hospitals for the insane for some fifteen years but never before have I seen such a sight as greeted my eyes as I entered these wards. Every patient, without a single exception, was tied hand and foot to the bed and every patient was a good example of the "howling lunatic" one reads about but which I had come to think did not in reality exist except in rare instances. It must be said, however, in justice to the hospital that all appearances indicated that they were obliged to do with very small appropriations. The number of attendants was extremely limited and all the appointments were of the simplest kind. Cheap care of the insane is always poor care.

The last institution visited was the manicomio at Naples. This institution is situated in the heart of the city and at its most elevated portion, it being necessary to climb a long steep hill to reach it. It is a very old building, having previously been a convent. The physician on duty received us in the laboratory where he was at work and we had a very pleasant conversation with him touching various scientific matters pertaining to psychiatry, and intimated that we would like to look over the hospital. He showed us very plainly that he did not care to grant this wish but finally on our insistence he went out of the room and evidently instructed several people to get things in shape for us to look at. After waiting some twenty minutes we were gingerly shown into two wards where all the patients had been previously lined up for our inspection.

The hospital is not only old but very primitive in its appointments and gave the same indication of small appropriations as did the one at Rome. The medical staff consists of some fourteen physicians who visit the hospital and make rounds on their several services each morning. One of the fourteen, however, is detailed for service throughout the twenty-four hours, so that one physician has such a detail once in two weeks. He is the only physician in the hospital after the morning rounds are made, and as there are some 1200 or 1400 patients it can readily be seen that the hospital very largely takes care of itself, especially when the one physician who is on duty spends all of his time in the laboratory. This is the expression of the extreme position to which the methods as they prevail in Europe in many places logically tend.

To my mind the chief distinction between the hospitals on the Continent and those of this country are that the European hospitals exert their efforts primarily along the lines of scientific advancement, while the American institutions exert their efforts primarily in the care of the patient. In the former instance if one or the other must suffer it is the care of the patient, in the latter instance, scientific research work. A great deal might be said upon the best method of dealing with the problem of uniting both of these interests. This, however, is an administrative problem and this is not the place in which to discuss it. It is quite clear that the physicians at both Rome and Naples understood that this feature, namely, the care of the patient, had not been properly provided for, for they both by their general attitude and manner endeavored to excuse the very evident conditions. I think therefore that the main fault lies in the extreme poverty of the country which makes adequate appropriations impossible. This was very well illustrated by a number of placards that were posted in the vestibule at the entrance to the Naples institution; they called for competitive examinations to fill the position of chief of staff in some two or three Italian institutions. The highest salary offered by any one of them was 3000 lira per annum and maintenance, the equivalent of approximately $600.00. It is surely well for the peace of mind of the physician who has to live on such a pittance that he has scientific interests with which to console himself.

It seemed quite surprising that in a single country conditions could be so widely different as at Naples and Rome on the one hand as compared with Florence on the other. It all goes to show I think that Italy is not even yet a completely united country and that the different portions still lead to a certain extent an autonomous existence. I heard on every hand, however, the highest praise for the King, whom it seems is exerting his every influence to help the country out of its poverty-stricken condition by the development of its commerce and natural resources.

It may be interesting, too, to know that something over a year ago a National Committee on the Causes of Insanity was organized under the patronage of the King of Italy. I had the honor of sitting with the Committee during its meetings in Amsterdam as proxy for the United States representatives who was unavoidably absent. The Committee is composed of representatives of practically all of the civilized countries. Their meetings have resulted thus far in organizing, and appointing a permanent secretary who is located at Zurich, and a permanent meeting place at Lugano. Their main efforts now are being concentrated on getting sufficient funds so that permanent quarters may be secured, clerks hired, and the necessary expenses for the everyday routine of business that will undoubtedly ensue, be met. After this is done they will take up the question of securing through the State Department access to the archives of the various Governments they represent for the purpose of obtaining such material as will aid them in throwing light on the problem under consideration.

Aside from what I saw of hospital construction and management, no small part of the benefits to be derived from such visits as I have recorded above results from the stimulus received by coming into personal contact with the men who are actually engaged in solving the problems of medicine and seeing the places where they do their work. I had the pleasure of meeting a great many physicians who are renowned as specialists in the various departments of nervous and mental diseases, aside from seeing a number of places that are of historic interest in the development of neurology and psychiatry, particularly Charcot's Clinic at La Salpêtrière.

MODERN MEDICINE IN CHINA.*

BY W. H. DOBSON, M.D., (G. W. U., 1895),

Surgeon in Charge Forman Memorial Hospital, Yeung Kong City, Kwang Tung Province, China.

When one leaves the progressive little kingdom of Japan and crosses the Yellow Sea to that land of mists and myths, Far Cathay, it is to leave the nineteenth and twentieth centuries to step ashore in the dark ages. In no one department of knowledge is this more true than in medicine. The Chinese have no science or generally practiced principles of that art. We have here a country of at least two thousand years growth, with history and mechanical arts progressing from that period, but during the same time there has not been one step in the divine art of healing. However, it is not my intention to give you history, which may be found in any good library; I am sure it is your desire to hear of my personal experience as a physician during the eleven years since the cutting of the cord by our revered Alma Mater.

In the beginning it is but just to state that nearly all the modern medicine practiced to-day in China is by medical missionaries sent out as representatives of various religious bodies in America and Europe. There are a few hundreds of native graduates of schools opened by these medical missionaries. None of these native physicians undertake surgery beyond minor operations unless they are serving in missionary hospitals. Thus you see the labor of upholding the principles for which we stand devolves upon one or two hundred white men and women.

One word of ancient medicine and the native herb doctor. You have all heard of his formidable prescriptions of tiger's bones, bear's gall, deer's horn, lizards, etc. The more filthy they are, the better medicine. All are given because they are "good for" the disease. In my dealings with patients they disclose the quack's classification of diseases and remedies by inquiring whether the ailment is cold or fever. The native doctor needs no study, no examination or other qualification. He has often failed in other business and has taken up drugs as a last resort. Many of the governmental literary graduates dabble in medicine for pecuniary profit. Should the doctor have had ancestors who followed the same calling he will gain the greater confidence of his countrymen. Alas, this confidence is not due to any belief in heredity but because the son will probably be in possession of many prescription books of his progenitors. His fees vary from one hundred cash, or five cents, to a chicken or a horse. I have seen herb doctor and parent haggle over a fee while precious moments of life were ebbing from the child.

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* Paper read before the University Medical Society, January, 19, 1907.

Putting on a solemn and "never made a mistake" air he feels three pulses in each wrist. He thus examines the six regions of the body, and no questions or other examinations are necessary. Many apothecaries employ a doctor to sit in the shop and see patients who buy their nauseous compounds before going out.

I have gone to such a length to describe these doctors and their ways in order that you may in part imagine the difficulties which we encounter in examining ignorant and superstitious people accustomed to the native quack. Take for instance a woman's hand and wrist presented from behind a curtain for diagnosis of, and relief from, impacted shoulder at the vaginal outlet.

In our practice of medicine and surgery we must always remain pupils of those who have time for original research. The medical man connected with the mission work is overwhelmed with the mass of suffering humanity. Serious cases come thick and fast allowing no time for detailed study of the individual or his disease. To alleviate gross suffering so as to permit of but a fair degree of health is in many cases the limit to which treatment is carried. Cases cannot be followed up except where they return to the hospital. The territory of one physician extends to a circle of often two hundred miles diameter, within which there are no brother physicians to share burdens and join in consultation. There are no means of comparison nor educational centers to visit.

Many of the larger hospitals have schools for instruction in Western medicine. The government is now opening some medical colleges with Japanese instructors. There is no opportunity for practical anatomy or post mortem investigation because of superstitious reverence for the dead. Dissections of animals and dissections in the operating room at present supply anatomical knowledge.

Some hospitals are locally supported but the majority look to American and European benevolence. The missionary physician charges a nominal fee where the patient is not too poor.

Sanitary problems are complicated by omnipresent insects and filth. Green vegetables fertilized with human excrement carry intestinal parasites and bubonic plague. China is innocent of sewerage or water supply systems. Hogs and dogs act as public scavengers, while old women follow the hogs and dogs to pick up their droppings. Filthy surface water finds its way into the public wells. Heavy spring rains providentially remove accumulations of months of filthy deposits. In our southern country mosquito nets are a necessity.

The food supply is one of our greatest questions. The common laboring classes do well to receive one meal of rice a day. When such people come for directions to take their medicine they remind one of the Irishman who when told to take his medicine after meals replied, "I can't do that sor, I haven't got the meals." To prepare a patient with bad chronic cystitis for operation for stone, or a phthisical individual for his fight for life we order eggs and meats but find that they are only able to obtain sweet potatoes and salt fish drippings.

The Canton Hospital, the largest in China, receives annually 27,000 dispensary visits and there are over two thousand operations performed in that time. Since leaving that hospital I have one under my exclusive charge where we have forty beds and receive 6,000 dispensary visits, and perform over three hundred operations yearly. I believe our hospital practice will compare with that in America. Asepsis with careful preparatory and after treatment keep down the mortality. The majority of surgical cases are chronic weakened individuals, and the mortality is less than one per cent. From the immediate relief it affords surgery is the most telling factor in our practice. Many operations are miracles in the eyes of those people. They are prone to applaud the opening of a simple abscess and to pass without notice a nice dissection in the carotid triangle in extirpating diseased lymphatics.

Lack of medical skill and ignorant tampering cause disease to appear in more extended and chronic forms than here in America. The felon of the distal phalanx becomes a general abscess of the hand; a comminuted fracture is seen after the bones have reunited in deformity; ulcers often cover one-half of the leg; spleens enlarge until the entire abdomen presents a hard surface; ring-worms runs off into surrounding space with the exception of the points where the ring crosses hand or foot; fifty to seventy pound abdominal tumors are of common occurrence, and fatty tumors weigh down their victims with years of burden. Acute exanthemata, common in America, are seldom seen with the exception of measles and confluent smallpox. In their places we have cholera, plague, beriberi, leprosy, tetanus neonatorum.

We cannot specialize. A list of operations for one day may show cataract, perineal lithotomy, internal hemorrhoids, an enormous ovarian cyst, and a club foot.

A large share of our attention is engaged with eye diseases. Trachoma with its resulting disorders holds the first place. In our operations for entropium I have developed what is to me a new procedure. It consists of a long loop suture catching the upper edge of the tarsal cartilage, thus anchoring the palpebral margin high up. I also use the excised strip of skin to fill in the gap covering the tarsal cartilage. Simple cataract extraction is the operation of choice in all uncomplicated cases.

Next in frequency to operations on the eye come those for urinary calculi. We rarely see stones in the pelvis of the kidney. The average weight of calculi is about one ounce, though two or three ounce stones are of common occurrence. Median perineal section with the incision extended laterally around the anus is our operation of choice. I have removed several three ounce stones through the perineum. Most of the specimens are composed of sodium urates. Occasionally one of calcium urates is seen. About ten per cent of lithotomies are performed on children of from three to six years of age, while one per cent are upon females. In the case of a boy of eight years I removed a long stone of one ounce in weight which was firmly attached to the bladder wall posteriorly. The free end was pointed and plugged the urethral opening upon contraction of the bladder. Straining had caused an extrusion of the prostate and rectum outside of the anus.

Tuberculosis is general. Results of treatment similar to those in this country can be had where there is proper food and outdoor life. We have many cases of tubercular caries. I had one case where the entire head of the femur was found loose underneath the skin over the hip joint. For one case of caries of the seventh cervical I had to make a complete adjustable iron brace to support shoulders and head from the hips. Iron rods, etc., were purchased in native shops.

The alveolar process of the lower jaw is often destroyed as a result of long continued tooth abscesses. In one case I found a sequestrum of the whole aveolar process together with the anterior portion of the ramus and coronoid process entirely separate lying under the mucous membrane on the outer side of the right jaw. The teeth were all imbedded in a new jaw which seemed sound and serviceable. We are called upon to replace a great many dislocations of the lower mandible from excessive gaping.

Speaking of teeth reminds me that the native tooth extractor uses his fingers which have been educated from childhood to act as forceps. A trial demonstration of my skill as a dentist was sought by an old woman on one occasion. She was so surprised and pleased when a tooth was painlessly removed that she immediately requested me to pull ten more.

In concluding this paper I shall briefly refer to some cases which may be out of the common run.

Field laborers present chronic painful enlargement of the posterior portion of the os calcis. The disease, while slow, has acute exacerbations of pain so severe as to prevent walking. At first I attributed these swellings to chronic inflammation and calcification of the bursa beneath the tendo achillis. Other cases showed a distinct enlargement of the whole posterior portion of the bone. There are no pathological data from microscopical examination. Maxwell of Formosa in "Tropical Medicine" has written of his experiences with this malady. All systemic remedies, together with counter irritations, and hot air baths fail. He has suggested the only treatment which is to raise a button of bone forcing a quarter inch trephine through into the spongy portion. This in most cases relieves the pain immediately.

A boy of six years was presented with the history of having fallen out of bed two days before. The only abnormal conditions present were constipation and a tumor about twelve inches in length extending from the left iliac through the hypogastric region up to the vicinity of the gall bladder. The tumor had a fecal consistency and was painless. The diagnosis was intusseption of the small intestine up the ascending colon to the right hepatic region. The fact that there was no inflammation permitted an attempt at reduction by taxis. This was accomplished and the ileo-caecal valve returned to its normal position. Now careful palpation disclosed the presence of a ball of ascaris lumbricoides obstructing the valve, and portions of the worms were made out extending along the ileum. After about one-half hour of manipulation to disentangle the worms, a gurgle and an almost immediate request to defecate resulted in the appearance of several ascaris, and a large quantity of fecal matter. No other treatment was necessary. The interesting point of this case was the possibility of distinguishing the presence of the worms by external palpation. I should be interested to hear from any one having a similar case.

Within a few miles of our hospital there is a locality from whence come many cases of Hodgkins disease. We have excised and treated them in many ways but the only useful treatment is the early removal of adenoids from the nasopharynx, and relieving all chronic conditions in the nose. This seems to stop the symptoms in many cases where I am certain the disease would have developed if not so treated.

I have never seen but one case of appendicitis in a Chinese.

The native household treatment of certain disorders is often pathetic. Hung around a child's neck we find a portion of a goat's horn to cure infantile or goat's paralysis. The tender skin of an infant shows many scars of the actual cautery applied to relieve colic. I saw one case where the child had been in convulsions followed by coma. The treatment was to force it to cry. To do this the grandmother bit to the bone on either side of the tendo achillis on each foot.

At a case of post-partum hemorrhage the following sight met my eyes: A woman squatted over a tub. Her head was covered with red grease and ashes from several lighted candles and sticks of incense stuck in her knotted hair. Behind her and grasping her hair was the brother of her husband with a large knife in his hand. He was making passes with the knife and savagely yelling "Get out, get out." In the back ground stood an old neighbor with a drawn sword and a musket. They were trying to frighten away the evil spirit causing the flow of blood. After a deal of persuasion they permitted the woman to get on the bed when a dose of ergot together with a little manipulation contracted the uterus and all was serene.

STERILITY IN THE MALE, ITS CAUSES AND SURGICAL TREATMENT.*

By FRANCIS R. HAGNER, M.D.,

Professor of Genitourinary Surgery.

It is only in the past twenty-five years that the subject of sterility in men has been carefully studied and valuable conclusions deduced. In earlier years unfruitful marriages were always ascribed to the wife, who in many instances was subjected to needless gynecological operations and treatment. If a man seemed well developed sexually, and was able to copulate in a normal manner, and had what seemed normal ejaculations of semen, he was considered potent, and failure to have offspring was always attributed to some abnormal condition in the woman.

With the advance in genitourinary surgery the condition of the semen and seminal tracts has been carefully studied, with the result of proving that in a considerable number of cases, where copulation was effected and the appearance of the semen was normal on microscopical examination, the fluid was found lacking in spermatozoa or else these cells were nonmotile or degenerated. As a net result of many investigations it may be stated, in general, that in cases of unfruitful marriages the husband is the sterile member of the family in about one case in six.

According to Kehrer, the cause of childless marriages is now sought much oftener on the side of man than has heretofore been the custom. Kehrer, himself, gives the results in a series of 96 cases. In 3.12 per cent there existed inability to copulate. In these cases there had been a preceding history of excessive masturbation. The men suffered from frequent pollutions, or their ejaculations were premature, and the penis could not be inserted into the vagina. Kehrer claims that impregnation may occur if a speculum be inserted into the vagina before copulation, and in several cases results were obtained by this maneuver. In 21.31 per cent azoospermia, absence of spermatozoa, existed. In practically all of these cases there was a history of gonorrhea with unilateral or more often bilateral epididymitis. Azoospermia was also found where no disease of the sexual organs had occurred, and where nothing abnormal in the genital organs could be demonstrated. Oligospermia, paucity of spermatozoa, was demonstrated in 11.45 per cent. Here there was a history of gonorrhea with epididymitis, or syphilis. It will be seen from this series of 96 cases that 63 per cent of the sterile cases had a history of gonorrhea with infection of the epididymis and prostate.

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*In collaboration with Homer G. Fuller, M.D. Read before the George Washington University Medical Society, April 20, 1907. Reprinted from *New York Medical Journal.*

Noeggerath found 8 sterile marriages in a series of 14 to be the fault of the male. Gross in 192 cases found the male deficient in 18 per cent.

Sterility in the male is due (1) to aspermia, non-secretion of semen; (2) to azoospermia, where the semen does not contain spermatozoa; (3) to oligospermia, where the spermatozoa are few in number; (4) to conditions where the spermatozoa may be motionless or the motility be transient, or (5) to obstruction to the passage of semen to the urethra or seminal vesicles, and the escape of semen outside of the normal channels, as in cases of hypospadias and fistula. Men with double undescended testicles are almost invariably sterile; so, too, is this the case in those whose testicles have received serious injuries causing destruction of the secreting structure or traumatic occlusion of the efferent ducts. This latter is a condition which obtains in cases of epididymitis; the exudated lymph fails to be absorbed, and becomes transformed into contracting connective tissue, which results in an obliteration of the tubes of the epididymis. Furthermore, the mouths of the ejaculatory ducts may be occluded as a result of operation for stricture, stone, or prostatic conditions. In the cases of azoospermia, absence of spermatozoa, the ejaculated fluid will present all the physical properties of normal semen, as regards smell, consistency, and so forth. Where we have small calibered strictures, the fluid is either forced back into the bladder or retained in the urethra behind the point of constriction, until erection subsides, whence the fluid slowly dribbles out. A few cases have been recorded where none of the reasons cited would hold, but these have been explained by the belief that the semen was perverted in quality or deficient in quantity, through constitutional depression or cachexia. Here the microscope would repeatedly disclose a state of azoospermia or oligospermia with the few spermatozoa showing but feeble motion or else complete absence of motion. And after no course of treatment other than that for the cachexia we would eventually find the presence of the procreative bodies and soon hear of an impregnation. Then, too, we are forced to consider the theory of apparent lack of affinity of the one cell for the other; we see this demonstrated in cases of a childless first marriage being followed on both sides by marriages resulting in a large family for each member of the former union. We hear of the so-called physiological and psychological question with which the stock breeders have to contend at times, and which forces them to set aside a prized stallion of known abilities for one of inferior pedigree.

Next to gonorrheal infections, frequent masturbation and sexual excesses are the most frequent cause of sterility in the male. The prolonged and frequent overstimulation of the secreting structure of the testicles finally results in exhaustion of the organ, the spermatozoa being imperfectly formed, even though the quantity and quality of the fluid may be apparently normal. The virility of the spermatozoa is often in direct proportion to the general physical condition of the patient. The oftrepeated shocks to the nervous system, which occur especially in masturbators, who take advantage of the time and place which are always convenient for their purpose, lowers the general physical condition, producing constitutional depression and cachexia, and thus affecting the virility of the spermatozoa. I have seen several of these cases perfectly cured by leading a hygienic sexual life.

In bilateral syphilitic and tuberculous disease, a considerable proportion are sterile on account of the destruction of the epididymis in tuberculosis, and the destruction of the testicle itself in syphilis. Another cause existing in this modern age is the X-ray. Workers in X-ray laboratories and physicians doing this work are the ones affected. One prolonged exposure has been known to cause sterility lasting three months. At first the spermatozoa are dead, and later disappear altogether. I know of seven workers in an X-ray laboratory in New York who have been sterile for over a year. I do not believe that any permanent cases have been reported from this cause. It is too early yet to say. One worker of my acquaintance was sterile for some months, but after keeping out of the rays for three months this defect disappeared and his wife became pregnant. When inflammation has attacked the greater portion of the prostate, so as to block up the ejaculatory ducts, after an orgasm there may be two or three viscid drops escape that contain principally pus cells and degenerated prostatic cells, but no spermatozoa. In other cases there may be so much pus present in the prostatic and vesicular secretions as to cause the death of the spermatozoa when they come into contact with this element of the fluid. The diagnosis of this condition should be made on microscopical examination by finding pus and dead spermatozoa in the fluid obtained by massage of the prostate and seminal vesicles.

I have seen several cases where the spermatoza were nonmotile that were cured by treatment of the prostatic condition, and in one case so much pus was present that part of the prostate was excised (care being taken not to injure the ejaculatory ducts); the pus disappeared and the spermatozoa regained their motility. The term false aspermia or malemission is sometimes employed to designate that condition in which normal semen is discharged into the urethra, but does not reach the meatus, flowing back into the bladder to be discharged drop by drop from the urethra after completion of coitus. This is commonly due to stricture, the caliber of which may be great enough not to interfere with micturition, when the circulation of the penis is unimpaired, but when the intense congestion incident to erection takes place, the caliber of the urethra is so reduced that no semen escapes.

The following case shows this very admirably: J. H. W. came to my office in September, stating that he had gonorrhea eight years before and an internal urethrotomy three years later; following the operation patient nearly bled to death, as he is a hemophiliac. He had had double epididymitis six years previous, and when I first saw this case I thought it a case of sterility due to epididymitis. The patient collected semen in a condom; the amount obtained was very small and proved on microscopical examination to be nothing but mucus. He had not complained of difficulty in urination, but on examination a No. 12 French bougie was the largest instrument that could be passed. After gradual dilatation the fluid ejaculated during intercourse appeared normal in amount.

As I have heretofore mentioned, the principal cause of sterility in men is bilateral gonorrheal epididymitis. Benzler in the *Archives of Dermatology and Syphilis* in 1898, in looking up the history of old soldiers who had gonorrhea while in the German army, found that among those who had been married three or more years 10.5 per cent who had suffered from gonorrhea without epididymitis were childless; these were probably the cases with chronic prostatitis and seminal vesiculitis; 23.4 per cent of those having unilateral epididymitis, and 41.7 per cent of those having bilateral epididymitis, were childless. It will be seen from all statistics that epididymitis is by far the most common cause of sterility, and it is most common in the cases where both sides were involved, almost 50 per cent being sterile. Statistics show that traumatic epididymitis, unless very severe, rarely leads to sterility. Orchitis probably never occurs in gonorrheal infections. I say this from results in twelve cases that I have operated upon, with acute epididymitis of the severe type, in none of which was the testicle itself involved.

In epididymitis it is well known that the globus minor is the portion of the epididymis most involved, and it is in this very portion that occlusion has the most dangerous results, as there is here but one efferent duct, while in the globus major the efferent ducts are numerous, and the obstruction of one or two would still leave open other channels. It was because of the known patulency of the globus major following gonorrheal epididymitis, when the globus minor and vas deferens in this region became occluded, that the operation of anastomosis of the vas deferens and the globus major was considered. The prognosis for the return of spermatozoa in these cases, unless operated upon, is positively hopeless.

Dr. Quinby of Boston has done some experimental work on guinea-pigs. He tied off the vas deferens at its exit from the globus minor, imperfectly formed, even though the quantity and quality of the fluid may be apparently normal. The virility of the spermatozoa is often in direct proportion to the general physical condition of the patient. The oftrepeated shocks to the nervous system, which occur especially in masturbators, who take advantage of the time and place which are always convenient for their purpose, lowers the general physical condition, producing constitutional depression and cachexia, and thus affecting the virility of the spermatozoa. I have seen several of these cases perfectly cured by leading a hygienic sexual life.

In bilateral syphilitic and tuberculous disease, a considerable proportion are sterile on account of the destruction of the epididymis in tuberculosis, and the destruction of the testicle itself in syphilis. Another cause existing in this modern age is the X-ray. Workers in X-ray laboratories and physicians doing this work are the ones affected. One prolonged exposure has been known to cause sterility lasting three months. At first the spermatozoa are dead, and later disappear altogether. I know of seven workers in an X-ray laboratory in New York who have been sterile for over a year. I do not believe that any permanent cases have been reported from this cause. It is too early yet to say. One worker of my acquaintance was sterile for some months, but after keeping out of the rays for three months this defect disappeared and his wife became pregnant. When inflammation has attacked the greater portion of the prostate, so as to block up the ejaculatory ducts, after an orgasm there may be two or three viscid drops escape that contain principally pus cells and degenerated prostatic cells, but no spermatozoa. In other cases there may be so much pus present in the prostatic and vesicular secretions as to cause the death of the spermatozoa when they come into contact with this element of the fluid. The diagnosis of this condition should be made on microscopical examination by finding pus and dead spermatozoa in the fluid obtained by massage of the prostate and seminal vesicles.

I have seen several cases where the spermatoza were nonmotile that were cured by treatment of the prostatic condition, and in one case so much pus was present that part of the prostate was excised (care being taken not to injure the ejaculatory ducts); the pus disappeared and the spermatozoa regained their motility. The term false aspermia or malemission is sometimes employed to designate that condition in which normal semen is discharged into the urethra, but does not reach the meatus, flowing back into the bladder to be discharged drop by drop from the urethra after completion of coitus. This is commonly due to stricture, the caliber of which may be great enough not to interfere with micturition, when the circulation of the penis is unimpaired, but when the intense congestion incident to erection takes place, the caliber of the urethra is so reduced that no semen escapes.

The following case shows this very admirably: J. H. W. came to my office in September, stating that he had gonorrhea eight years before and an internal urethrotomy three years later; following the operation patient nearly bled to death, as he is a hemophiliac. He had had double epididymitis six years previous, and when I first saw this case I thought it a case of sterility due to epididymitis. The patient collected semen in a condom; the amount obtained was very small and proved on microscopical examination to be nothing but mucus. He had not complained of difficulty in urination, but on examination a No. 12 French bougie was the largest instrument that could be passed. After gradual dilatation the fluid ejaculated during intercourse appeared normal in amount.

As I have heretofore mentioned, the principal cause of sterility in men is bilateral gonorrheal epididymitis. Benzler in the *Archives of Dermatology and Syphilis* in 1898, in looking up the history of old soldiers who had gonorrhea while in the German army, found that among those who had been married three or more years 10.5 per cent who had suffered from gonorrhea without epididymitis were childless; these were probably the cases with chronic prostatitis and seminal vesiculitis; 23.4 per cent of those having unilateral epididymitis, and 41.7 per cent of those having bilateral epididymitis, were childless. It will be seen from all statistics that epididymitis is by far the most common cause of sterility, and it is most common in the cases where both sides were involved, almost 50 per cent being sterile. Statistics show that traumatic epididymitis, unless very severe, rarely leads to sterility. Orchitis probably never occurs in gonorrheal infections. I say this from results in twelve cases that I have operated upon, with acute epididymitis of the severe type, in none of which was the testicle itself involved.

In epididymitis it is well known that the globus minor is the portion of the epididymis most involved, and it is in this very portion that occlusion has the most dangerous results, as there is here but one efferent duct, while in the globus major the efferent ducts are numerous, and the obstruction of one or two would still leave open other channels. It was because of the known patulency of the globus major following gonorrheal epididymitis, when the globus minor and vas deferens in this region became occluded, that the operation of anastomosis of the vas deferens and the globus major was considered. The prognosis for the return of spermatozoa in these cases, unless operated upon, is positively hopeless.

Dr. Quinby of Boston has done some experimental work on guinea-pigs. He tied off the vas deferens at its exit from the globus minor,

THE PHILOSOPHICAL FOUNDATIONS OF CHARLATANRY IN MEDICINE.*

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It is not the object of this paper to endeavor to point out how the human race has gradually passed from those phases of intellectual development where it contemplated with craven fear the "signs and wonders" in the skies to the appreciation of the beauty and majesty of law in the heavens; or from the "Prince of the Power of the Air" to meteorology; or from magic and all of the black arts to physics and chemistry; or from the miracles of the Middle Ages to modern medicine; from fetichism to hygiene; from demoniacal possession to insanity; from diabolism to hysteria; or from legendary history and folklore to comparative mythology. In short, the object of this paper is not to epitomize the history or the evolution of modern medicine. Neither is it the object of this paper to indicate the history of the conflict of superstition with modern medicine, for we had a very interesting paper of this kind from Dr. James Dudley Morgan last December. Rather it is the object of this paper to attempt to indicate the reasons for the existence of so many aberrations in medical beliefs and medical practices on the part of the public at large.

All educated and experienced physicians are aware of the fact of the extensive prevalence of charlatanry throughout the history of human culture and at the present time; they also are aware of the fact that the patrons and dupes of what educated physicians call charlatanry are not confined to any class of men or women. Men and women of the highest culture and refinement, as well as ignorant persons, are among the partisans and the disciples of many vagaries in medicine.

It has, therefore, seemed to the writer that it might prove interesting as well as instructive to devote some thirty-five minutes to an endeavor to seek out some of the underlying principles of successful charlatanry.

Probably quite a number of factors could be mentioned as helping to constitute the philosophical foundations of charlatanry in modern medicine. But at least five factors stand forth as elements of stupendous power in cultivating and maintaining such an extensive field of charlatanry as may be witnessed in any modern state, whether civilized, barbarian or savage. These factors are: (1) Human suggestibility; (2) reasoning by analogy in modern people; (3) reversions to primitive methods of philosophizing (mostly analogical reasoning); (4) the assumption that ideal associations have corresponding material connections (mostly analogical reasoning); (5) morbid imagination.

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* Extracts from the annual address as President of the Medical Society of the District of Columbia, given Dec. 18, 1907.

These five factors are easily reducible to three, viz: ***suggestion, reasoning by analogy,*** and ***morbid imagination.*** . . .

The concomitance of ideation and cerebration is a fact of overwhelming importance in the study of the mental activities of mankind. It thrusts itself upon the attention of the thoughtful psychologist and biologist.

It constitutes the scientific and philosophical basis of that factor of supreme importance in the beliefs and conduct of the human race, viz: of human suggestibility.

Suggestion and persuasion are practically identical in that they both inculcate ideas, the former appealing to blind faith, and the latter to logical, clear and critical reason. Bechterew has cleverly written that logical persuasion enters the understanding by knocking at the front door, while suggestion enters by the back stairs. Dubois has estimated that only three per cent of the human race are free from the slavery of suggestion. He goes on to say that human suggestibility is incommensurable. It enters into every act of life, colors all our sensations with the most varied tints, leads our judgment astray and creates illusions in spite of our reasoning faculty. As soon as we leave the firm ground of mathematical reasoning we experience an incredible difficulty in resisting suggestion. When we form an opinion it is very rare that logic is the only cause. Esteem, affection, our secret desires and feelings, the charm of language, the tyranny of words, all mingle with the cold current of logic and lead us into error.

Ideas are so powerful that not only can they modify or distort a preexisting idea or sensation, but they can create sensations in their entirety. There are thousands of persons who, the moment they have read about or heard described a group of symptoms, immediately feel those symptoms. Certain persons experience a sensation of touching oil and the smell of petroleum in taking up a lamp which has never held any oil. The wine which is poured out of a dusty bottle bearing the label of a celebrated vineyard always seems better than it really is. The majority of persons feel various sensations in touching the pole of an electric apparatus when it furnishes neither currents nor discharges.

The credulity of the multitude finds its justification in human suggestibility. The suggestions of charlatans, whether verbal or in printed circulars, or in newspaper advertisements, constitute a very extensive and immensely fertile field for disseminating broadcast errors and superstitions in all matters pertaining to medicine. It was due to suggestion or psycotherapy that so many cures were made in the Middle Ages by pilgrimages to the tombs of saints, by holy waters, and by being in the presence, or by touching the relics, of saints. It is due to the overpowering sway of suggestion that so much is accomplished in modern times by christian science (a parody upon Christianity), by osteopathy, by patent medicines, and the like. . . . .

It is sad to relate that physicians themselves are too often to blame for the undue sway of suggestion in medical affairs, and that charlatans and places of pilgrimage profit by the mistakes of physicians. Physicians too often declare that a disease is incurable. They make erroneous diagnoses or fail to accomplish any good, and too often forget the influence which the mind exercises over the functions of the viscera. They forget that when the desires of the sick and those who are suffering harmonize with the suggestions of charlatanry, then is a golden opportunity for wonder-workers of all kinds.

When, added to the above considerations, charlatans come in contact with invalids who have mental defects or a characteristic lack of logic, then does suggestion have all the firmer sway. When the mind is not critical and logical, or when, though critical and logical, it is not versed in at least the elements of medical knowledge and medical history; when it knows nothing of the history of charlatanry, and of the potency of suggestion; when, in addition to these factors, considerations of economy or parsimony are present, then, no matter how great the attainments of this mind may be in other fields of culture or human endeavor, this mind may at any time become the patron or the dupe of the grossest vagaries in medicine or charlatanry.

Now let us turn from human suggestibility to human reasoning by analogy. The clever Lord Chesterfield relates, in one of his charming letters, that the English King had been ill, and that people generally expected the illness to be fatal, because the oldest lion in the Tower, about the king's age, had just died. And then he exclaimed in his letter, by way of comment, "So wild and capricious is the human mind." But Tylor, in his fascinating work on "Primitive Culture," says that the thought was neither wild nor capricious, but was simply such an argument from *analogy* as the educated world has at length painfully learned to be worthless; but which, it is not too much to declare, would to this day carry considerable weight to the minds of four-fifths of the human race.

On this principle it is easy to understand how the art of taking omens from meeting and seeing animals, and therefore how augury originated. It is perfectly clear why the omen of the vulture should mean rapacity; why flies, returning however often they are driven off, should be the signs of impudence and importunity, while bees, types of an obedient and industrious community, should be the omen of luck to a king. It is still plain to us why there should be a foreboding of ill from the owl's doleful note, and the suggestion of victory from the fierce swooping hawk, a thought which, in mediæval Europe, made the bird of prey the warrior's omen of conquest.

The modern German peasant who says that meeting a flock of sheep is lucky, but a herd of swine unlucky, and the Cornish miner who turns aside in horror on meeting a rabbit or an old woman on his way to the pit's mouth, are illustrations of survivals in culture, and are to this day keeping up relics of primitive culture as genuine as any flint implement dug out of a tumulus. The art of taking omens from dreams is explained by the same principle.

Man, having learned to associate in thought those things which experience revealed as connected in fact, has often proceeded erroneously by reasoning from analogy to invert this process, and to assume that association of ideas must involve analogous associations in reality. In the hands of the trained and skilled observer and experimenter this process is invaluable and is called the scientific use of the imagination. It enabled Leverrier and Adams, independently, to predict the existence and the discovery of the planet Neptune before it was known to exist. But in the hands of any but rigidly trained thinkers, checked and balanced by rigid rules of evidence, the process leads to the wildest vagaries. This is not only true of man in his primitive culture, but also of men of the highest culture in the Middle Ages, and of many modern men, ignorant and educated alike.

By a vast mass of evidence from savage, barbaric and civilized life, magic arts which have resulted from thus mistaking an ideal for a real connection may be clearly traced from the lower culture where they originate to the higher culture in which they are survivals. Such are the practices through which a distant person is to be affected by acting on something closely associated with him, as his property, clothes he has worn, and especially all cuttings of his nails and hair. Not only do savages, high and low, live in deadly terror of this witchcraft, but even European folklore preserves this primitive reasoning, and the modern German peasant, during the days intervening between his child's birth and baptism, is unwilling to lend anything out of his home, lest witchcraft should be worked through it on the unconsecrated baby.

When we hear of North American Indians making images of their foes, whose lives they expect to shorten by piercing these images with their arrows, we should remember that these savage people have their representatives among us moderns in the Devonshire peasant of England, who hangs in his chimney a pig's heart stuck all over with thorn-prickles, so that the heart of his enemy may likewise be pierced.

There is no better subject matter through which to trace the history of the laws of the mind and to study, therefore, the processes of the imagination and of analogical reasoning, than the well-marked incidents of mythical history; for these incidents range through every known period of civilization, and through all the physically varied tribes of mankind.

The rough nature-myths of savages are the expression of the lessons they have learned from their child-like contemplation of the universe. They are at once the science, the philosophy and the region of primitive man. The anthropologist traces these rude nature-interpretations up into times when they were molded into complex systems of mythology, stiff and monstrous in Mexico, distorted into bombastic exaggeration in the Asia of Buddha, but gracefully artistic in classic Greece. He can observe how the mythology of ancient Greece and Rome, once so true to nature, came to be considered as allegory and was then degraded into sham history. Finally, in our modern civilization, we find that relics of the structures which were reared with such strength and skill by the primitive observers of nature, or the myth-makers, must now be sought in vulgar superstitions, in scraps of nursery folklore, in old dying legends, in fragments of old ideas which still hold an inherited rank gained in past ages of intellectual history, and, finally, in thoughts and allusions carried on from ancient days by the perennial stream of poetry and romance.

The stupendous results that have been achieved by reasoning from analogy can be briefly though profitably illustrated by noting primitive man's mental attitude towards the striking phenomena of the heavens, chiefly in sunrise and sunset, cloud and storm, in meteors, comets and constellations, and the like.

We moderns pride ourselves upon our coldly prosaic and rational temper towards natural phenomena. We have come to believe that all events are taking place regularly in strict conformity to law. But primitive man knew nothing about physical forces, nothing about the laws of nature, nothing about the necessary regularity of things.

Where the activities of the human mind, whether primitive or modern, are not headed off and checked in various directions by established and rigid rules of experience, this same human mind can develop an unlimited capacity for believing and fancying. The fact that the ancient inhabitants of India regarded the rain clouds as cows with full udders milked by the winds of heaven, is not one whit less incomprehensible than many beliefs that have been entertained by many medieval and modern men.

The sole measure of things that primitive man possessed was himself; consequently he made the natural deduction (based upon reasoning by analogy) that everything that moved or had power of movement, did so because it was alive. A personal will and life was attributed to night and day, to waterfall and whirlpool, and in a thousand different forms this conception was expressed. The thunder was the roar of a mighty beast; the lightning a serpent darting at its prey. The modern conception of the phenomena accompanying the revolution of the earth upon its axis in twenty-four hours, was explained by early man as the swallowing up and casting forth of Day by Night. Night was commonly personified as a huge wolf.

This scientific explanation of day and night by primitive man we now designate a myth, whether it has evolved, in the course of ages, into the legend of Tom Thumb, who was swallowed by the cow and came out unhurt, or the pretty story of little Red Riding Hood. This story is mutilated in the English version, but is known more perfectly by old wives in Germany, who can tell that the lovely little maid in her shining red satin cloak was swallowed with her grandmother by the wolf, till they both came out safe and sound when the hunter cut open the sleeping beast.

The primitive man's conception of the ultimate victory of the personified Sun with his unerring rays over the demons of frost and snow in Winter, has given rise to the conception of infallible skill in archery, which underlies such a great variety of popular fairy tales. The story of William Tell is the last reflection of the beneficent divinity of Summer.

Again, throughout the whole of Indo-European mythology the souls of the dead are supposed to ride on the night-wind, with their howling dogs, gathering into their throng the souls of those just dying as they pass by their houses. Hence, when a person dies it is still customary, in many parts of Europe, to open the windows so that the soul may easily join the mystic cavalcade. The howling dog, whose appearance under the windows of a sick person is such an alarming portent to some persons, is but the modern echo of the wish-hound of Hermes, or, in other words, the tempest or howling wind personified as a great dog or wolf by early man. To this day, as the gale sweeps past their cottage doors the English peasants believe they hear the wail of the spirits of unbaptized children. In Persia and India, when a person is dying a dog is brought to the bedside in order that the departing soul may be sure of a prompt escort. In classic Greece we have the fleet greyhound of Hermes come to escort the soul to the river Styx.

So it is with so many popular stories such as that of Hercules, Odin, Cinderella, the Sleeping Beauty, etc.; they are the offspring of nature-myths, the result of primitive man's attempt to explain the phenomena of nature by reasoning from analogy.

Primitive man universally believed that the soul can temporarily quit the body during lifetime. It was the only way he could explain the phenomena of dreams.

Then away down the current of time, in the Middle Ages, the phenomena of catalepsy and trance were cited in proof of the theory that the soul can leave the body and afterwards return to it. Further, the intensely realistic mind of antiquity arrived at the notion that the souls of men could enter into the bodies of beasts, and also into inert objects, as stones, idols, pools, and the like.

These pagan theories, however, did not acquire their most horrible features until they came in contact with and were modified by the theology of the Middle Ages. Then witchcraft blossomed forth and continued even into our period of colonial history. A theory which, it has been estimated, resulted in the burning alive of nine millions of human beings.

One phase of it was the development of the dreadful theory, or, as we call it now, the superstition of werewolves; the superstition that with the aid of demons human beings could leave their material bodies reposing in sleep peacefully at home, while their souls were in the bodies of wolves preying upon cattle, children, women and men. This superstition, originated and intensified through reasoning by analogy, was apparently confirmed by many singular phenomena. It is known that in comparatively civilized countries, there have been cases of monstrous homicidal insanity. Going a step further, we find the propensity to murder has been accompanied by cannibalism. There have been a great many cases in which the homicidal and cannibal craving has been accompanied by hallucinations. Many of the insane cannibals described by Mr. Baring-Gould thoroughly believed themselves to have been transformed into wolves or other wild animals. Even in our own day the idea has not entirely died out of the French peasant's mind. A little over thirty years ago Mr. Baring-Gould was unable to persuade a peasant to guide him across a wild place after dark, because it was haunted by a werewolf. The theory of werewolves was the attempt of the cultured people of the Middle Ages to explain the obscure phenomena of insanity.

When, in those times, a person fell in a fit they shouted, "He's struck with a fairy dart," whereas we exclaim, "epilepsy."

Our modern word nightmare is the survival of a medieval theory of a female demon who sits upon one's bosom and hinders respiration. We moderns may say "indigestion," but they exclaimed "night demon," or Night Mare.

The relation of morbid imagination to myth, combined with crude reasoning by analogy, is illustrated not only in the terrible theory of werewolves, but in the well-known disease called by the English name of shingles, from the Latin word *Cingulum*, a girdle. This well-known irritating herpetic disease tends to encircle the body as with a girdle. Tylor says that, by an imagination not difficult to understand, this disease is attributed to a sort of coiling snake; and that he remembered a case in Cornwall where a girl's family waited in great fear to see if the creature would stretch all around her, the belief being that if the snake's head and tail met, the patient would die.

That primitive philosophy of nature in which all forces objectively existing are conceived as identical with the force subjectively known as volition, is interestingly illustrated in the superstition that harm is sure to come to him who saves the life of a drowning man. This superstition is a survival in culture. In the older form of the belief it is held that the rescurer will sooner or later be drowned himself; and thereby we pass to the fetichistic interpretation of drowning as the seizing of the unfortunate person by the water-spirit, who is naturally angry at being deprived of his victim, and henceforth bears a special grudge against the bold mortal who has thus dared to frustrate him. Again, it is still believed by some venerable granny that it is wicked to kill robins. At an earlier date the superstition assumes the shape of a belief that the killing of a robin portends some calamity; in a still earlier form the calamity is specified as death; and again, still earlier, as death by lightning. Another step backward reveals that the dread sanctity of the robin is owing to the fact that he is the bird of Thor, the lightning god; and finally we reach that primitive stage of philosophizing in which the lightning is explained as a red bird dropping from its beak a worm with the power to cleave even rocks.

Centuries ago, the Portuguese in West Africa, noticing the veneration paid by the negroes to certain objects, such as plants, pebbles, idols, claws of beasts, etc., very fairly compared these objects to the talismans and amulets with which they were themselves familiar, and called them *feitico* (meaning a charm), whence we get our English word fetich. Fetichism was universal in the primeval world. These primitive philosophers, reasoning with reckless analogy, believed that all sorts of spirits could reside in these objects—the kindly, helping spirits of powerful ancestors, as well as those of enemies. They were exorcised or appealed to, therefore, in multitudes of ways.

Referring to fetiches, Pliny informs us how pains in the stomach may be cured by transmitting the ailment from the patient's body into a puppy or duck, which will probably die of it. After the birth of a Chinese baby, its father's trousers, used as a fetich, are hung in the room upside down, so that all evil influences may enter into them instead of into the child. Modern folklore still cherishes such ideas. Although the terrible "black witchcraft" has died out from modern civilization, anthropologists may still study in the "white witchcraft" of modern European peasants the arts of curing a man's fever or headache by transferring it into a bird, or a crawfish, or of getting rid of ague or warts or gout by giving them to a willow, fir or ash tree with suitable charms. In England, warts may be touched each with a pebble, and the pebble in a bag left on the road to church, to give up their ailments to the unlucky finder; in Germany a plaster from a sore may be left at a crossway to transfer the disease to a passer-by. In Thuringia it is considered that a string of rowan-berries, a rag, or any small article, touched by a sick person and then hung on a bush beside some forest path, imparts the malady to any person who may touch this article in passing, and frees the sick person from the disease. It is stated on medical authority that the bunches of flowers which children offer to travelers in Southern Europe are sometimes intended for the ungracious purpose of sending some disease away from their homes.

Apart from the wretched selfishness and immorality of such practices, do they not help to furnish an insight into the human mind? Do they not prove, along with much that has been said in this paper, that there are inherited tendencies, and that there may be atavisms tucked away in the recesses of the average human mind, that may, under certain circumstances, render them susceptible to almost any kind of vagaries, and therefore to vagaries and charlatanry in medicine? The circumstances may be ignorance, wasting diseases that impair the better faculties of the mind, a poor mental inheritance, an unpropitious environment, or, as I have already intimated, reversions to primitive methods of philosophizing.

Can one detect any great difference between the personifications of the forces of nature by primitive men and the views of nature held by the most learned persons in the fifteenth, sixteenth and seventeenth centuries throughout Christendom? Catholics and Protestants alike believe that there was diabolical agency in storms, pestilence, insanity, and in fact in all disease. Martin Luther supported the theory most zealously, frequently asserting his belief that the winds themselves were only good or evil spirits. Moreover, we find Luther deliberately asserting that a stone thrown into a certain pond in his native region would cause a dreadful storm because of the devils kept prisoners there. The childish remedies employed against diabolical agency in the air and against pestilence were exorcism, fetiches of various sorts, ringing of church bells, parades carrying saints' relics, etc.

But have we not with us in modern times large numbers of persons wearing "electric" belts and "magic" foot-pads in the same fetichistic frame of mind?

In our own time West Africa is still a world of fetiches. The traveller finds them on every path, at every ford, on every housedoor; they hang as amulets around every man's neck, they guard against sickness or inflict it if neglected, they bring rain, they fill the sea with fishes willing to swim into the fisherman's net, they catch and punish thieves, they give their owner a bold heart and confound his enemies; there is nothing that the fetich cannot do or undo, if it be but the right fetich. On the theory of inherited fetichistic instincts the usefulness of the placebo in medicine and the success of patent medicines may be due at times to something other than the power of suggestion.

Thus the one-sided logic of the barbarian, based upon careless reasoning by analogy, making the most of all things that coincide with his primitive philosophy, and glossing over all that fails, has shaped a universal fetich-philosophy of the events of life. So strong is the pervading influence, that the European in Africa is apt to catch it from the negro, and himself, as the saying is, "become black." Thus, even to this day some traveller, watching a white companion asleep, may catch a glimpse of some claw or bone or such-like sorcerer's trash secretly fastened around his neck.

Modern European life shows well-marked traces of the ancient science and philosophy of spirits or mysterious influences inhabiting objects. The Tyrolese object to using grass for toothpicks because of the demons that may have taken up their abode in the straws. The Bulgarians hold it a great sin not to fumigate the flour when it is brought from the mill (particularly if the mill be kept by a Turk) in order to prevent the devil from entering into it. Amulets are still carried in the most civilized countries of the world by the ignorant and superstitious, with real savage faith in their mysterious virtues, and by some enlightened person in what seems to be more than a quaint survival from the past. Certainly in all these persons who are found in modern life, and wherever found, we have the intellectual foundation for the reception and the encouragement of all sorts of aberrations in medical practice and medical belief. It is the writer's deliberate conviction that multitudes of worthless proprietary medicines and mechanisms, that are sold throughout the civilized world, would go out of existence were it not for the fetichistic taint that survives in so many persons' minds. The stupendous sales of so much worthless trash in the name of medicine cannot be accounted for on the grounds of mere ignorance. For where is education more generally diffused than in the United States? And where do quackery and charlatanry in medicine find a greater paradise?

Nor could the tremendous force of *suggestion*, as met with in the innumerable advertisements in newspapers and printed circulars, accomplish so much harm as they undoubtedly do, were it not for that bias in so many minds that has its foundation in the depths of primeval philosophy.

Let us glance for a moment at fetichism in high places and among the educated in medieval and modern times. You can go to the cathedral at Cologne, Germany, and observe the relics of saints there which are believed to have healing properties, or you can study the faith cures of Boston, or Old Orchard in this country. You can investigate the efficacy of the royal touch in sundry diseases, commencing with inches. At that time she had no elevation of temperature. The usual treatment of hot fomentations did not relieve her, so morphia was resorted to.

On August 9, two weeks after the beginning of the attack, she had a slight chill which was followed by a temperature of 102 degrees. This was the only time I ever knew her to have a fever temperature in any of the attacks I had seen her in during the past ten years. She rapidly lost strength after this, her pulse became very weak and rapid, and she was quite delirious for about a week. At this time I had Dr. W. P. Carr to see her with me in consultation for his opinion as to the advisability of operating on her. Her condition at that time was so bad that he declined to advise operation; as a matter of fact both of us thought she had but a few days to live, and gave the family a very grave prognosis. She was treated expectantly with heart stimulants, whiskey was given freely with milk, which was about all of the nourishment she had. It was very difficult to nourish her, and but for the close attention of a most faithful and competent nurse, I am sure she would have died. This condition of affairs, with the temperature ranging from 101 to 103, continued for about ten days, when she began to improve slowly; at this time it was very evident the enlargement was decreasing in size and becoming much softer. From this time on her improvement was very rapid and by September 3 she was up, and within another week she was able to go out daily and to do light housework. I never saw one improve so rapidly in all of my experience and in a few weeks she was as robust as ever. She continued in perfect health until November 4, when she was again taken with one of her old attacks as usual. She at once went to bed and resorted to her hot fomentations, etc., but as the pain increased and she again noticed the usual enlargement, she sent for me. I at once arranged to have her transferred to the George Washington University Hospital for an operation, as her condition at this time I thought would justify it. This attack she said was more violent than any she had ever had, and on the second day her temperature rose to 103 degrees. She was very anxious to be operated on, as she said she knew she could not go through another such attack as the one she had had in the summer.

She was operated on by Dr. Carr on November 7. As neither Dr. Carr nor myself was sure of the diagnosis, believing that it was either an enlarged spleen, or a case of hydronephrosis, he made his incision just to the outside of the left rectus muscle, which was about the center of the enlargement. As soon as the abdomen was opened it was evident that it was a case of hydronephrosis. The sac contained at least a quart of fluid which at first ran clear, but was followed by a copious discharge of pus, and with the pus came a pear-shaped stone about the size of a bluebird's egg. The diagnosis was now very clear, that it

ABSTRACTS AND REPORTS.

I. DIET IN TYPHOID FEVER. (FISKE FUND PRIZE ESSAY, 1907.)

This paper is an effort to work out the theoretical basis and the proper practice of feeding in typhoid fever. In it is developed and presented the view that the dietetic regimen now prevalent for typhoid-fever patients is needlessly and harmfully restricted, that the objections to and fancied dangers of a mixed diet are groundless and mythical, and that these patients should receive a more generous and more varied diet than is now allowed.

The history of feeding fever patients is reviewed, for the purpose of showing that the fear of soft and solid food in fever is a surviving vestige of the antiphlogistic doctrines of the medieval period; and also to show the empirical way in which the present methods have developed.

From a consideration of the data afforded by published metabolism studies in typhoid fever the essential nutritive requirements of an adequate diet for this disease are tentatively fixed at about 100 grams of proteid and 1800 calories of total energy daily for a medium-sized subject.

The data available as to the digestive powers during typhoid fever are then discussed, from which it appears that the digestion of proteids and fats during the febrile period is reduced only 5 to 10 per cent from the normal, a reduction far less than has been generally supposed, on the basis of vague impressions and dogmatic assumptions, to be the case. This degree of digestive power is amply sufficient to enable the patients to assimilate a generous amount of food.

The various possible injurious effects of improper feeding in this disease are discussed, as with reference to the production of gastric and intestinal indigestion, aggravation of the ulcerated conditions, the effect of diet on the temperature, and its relation to relapses and coagulation of the blood. A comparison of the customary diet with the dietary advocated is made with regard to these points, and reasons are presented for the claim that as much harm, and even more, can be brought about by the improper use of milk and soup as by any other food.

The availability of the various food articles for typhoid feeding is discussed and an ample and varied diet list presented, including milk, eggs, puddings, meats and similar articles, from which selection can be advantageously made.

The results and statistics of the actual employment of the generous and varied diet by clinicians in all parts of the world are presented, showing the safety and advantages of its use, in contributing to the comfort and contentment of the patients, in shortening the period of convalescence, and above all in maintaining the patients' strength and resisting power at a maximum so as apparently to be capable of effecting a distinct lowering of the death rate from the disease.

JOHN BENJAMIN NICHOLS, M.D.

II. A NEW METHOD OF PERFORMING ARTIFICIAL RESPIRATION ESPECIALLY APPLICABLE IN CASES OF DROWNING.[1]

The importance of prompt aid in cases of asphyxia from any cause or causes cannot be overestimated, and any new or improved method for bringing back to life these individuals should have a careful trying out and should be exclusively employed for this purpose if it be found to have distinct advantages over the older methods. It is the purpose in this paper to describe a method that has recently been devised by Professor E. A. Schäfer, of Edinburgh, which from the description and demonstration on normal subjects appears to have many advantages over the older methods.

In the case of a drowned person, immediately after being taken from the water, the patient is placed prone on the ground. The head is allowed to fall forwards and somewhat sideways. The mouth is open and the tongue naturally protrudes from the mouth. No manipulation of the tongue is necessary. The operator kneels by the side of or across the buttocks of the patient, places his hands flat upon the back over the lowest ribs and with the weight of his body presses firmly and gradually so as to expel the contents of the lungs. On relieving the pressure, which is done by the operator slowly swinging his body up without removing the hands from the back, the chest of the patient resumes its former dimensions and fresh air is drawn into the lungs. The alternate pressure and relief is repeated about once every five seconds, not oftener. The amount of air that can be introduced into the lungs in this way, by the pressure transmitted to the chest and abdomen and then by the release, is never less than 500 c.c., and may attain 1000 c.c. or more each respiration. By repeating the movements twelve times a minute an air exchange of from 6000 to 12000 c.c. can readily be effected. This is more than enough to maintain efficient respiration. On the passive living subject Professor Schäfer demonstrated this at the meeting of the International Physiological Congress, and it is easy for anyone to prove by the use of a proper face mask and spirometer. Professor Schäfer strongly urges that the movements of pressure be made slowly, and *not more often* than once in five seconds. Ten movements a minute will be ample for all purposes.

The usual method employed for resuscitation, that of Howard, is not so good as the method advocated by Schäfer and it has the following disadvantages. (A) With the patient lying on the back the tongue tends to fall towards the pharynx and to block the passage of air. (B) Water and mucus tend to accumulate at the back of the mouth and in the pharynx and thus to close the air passages. (C) When the pressure is exerted upon the front of the ribs there is the risk, especially in elderly subjects, of fracturing the lower fixed ribs, with a resultant traumatic pneumonia in case the individual recovers from the asphyxia. (D) In cases of drowning the liver is greatly congested and if much pressure is exerted upon this region there is danger of producing rupture of the liver, with no chance of the patient's recovery.

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[1] Read before University Medical Society, Oct. 19, 1907.

The carrying out of the new method of Schäfer is less fatiguing to the operator than that of the older methods, such as the Silvester, the Pacini, and the Marshall Hall. With the methods just mentioned it has been found impossible to keep up artificial respiration in a normal but passive subject for any length of time on account of the discomfort and the relative inefficiency of the air exchange, whereas by the new method artificial respiration has been maintained in a passive normal subject for as long as an hour without any fatigue on the part of the operator and without any "air hunger" on the part of the subject.

It is easy to understand that the amount of air exchange by exerting the pressure on the back when the patient is in the prone position is much greater than that by pressure on the chest when the patient is supine. In the supine position part of the pressure is used to distend the abdomen, while with the prone position pressure is exerted over not only the chest but also the abdomen. In the latter method the lung air-space is decreased and increased (expiration and inspiration) much more than in the supine position because instead of having a descent of the diaphragm with the pressure there is an ascent. Comparative measurements on the passive living subject have demonstrated that for periods of time beyond two or three minutes the prone position gives better results than the supine position, although it has been found that with certain methods single measurements give better results than the method of Schäfer. It must be kept in mind, however, that in practising resuscitation it is not a matter of one or two or even a dozen movements. The most efficient method is the one that gives the best results for periods of time beyond ten minutes, for in some cases it is necessary to keep up the movements for an hour or two at a time.

The method has been tested with success in cases of drowning, and the demonstrations on the living subject impressed all with its simplicity and efficiency. Because of its obvious advantages the method should be given first place in courses of ambulance and "first-aid" instruction.

SHEPHERD IVORY FRANZ, Ph.D.

III. THE FUNCTIONS OF THE FRONTAL LOBES.[1]

In his paper the reader first took up for consideration all of the important published work on the frontal lobes and considered the hypotheses that had been advanced to explain the functions of this region of the cerebrum. It was pointed out that the earlier investigators considered the frontal part of the brain "the seat of intelligence." Later observers and experimenters recorded facts that were interpreted in different ways according to the emphasis that was laid on the clinical or the experimental evidence. Three hypotheses were advanced at different times: (1) This region of the brain is motor in function, (2) it is inhibitory, and (3) it is the center for states of attention. More recently there has been a return to the earlier view, viz., that the frontal lobes are concerned with the so-called intellectual processes. The experimental and clinical evidence was considered in relation to each of the four hypotheses and the fourth was found to satisfy the facts better than any one or more of the other three. It was pointed out that the facts at hand did not justify a very strong assertion in this matter, and that the most recent attempts to minimize the importance of the right frontal region were not justified by the facts that have been reported. As a contribution to help solve the problem the results that were obtained after extirpation or destruction of the frontals in monkeys and cats were reported, and it was shown that with the employment of a new method it was possible to get data from animals comparable with results from man.

The results with the new method showed clearly—a thing not shown before—that there is a mental change in animals following the removal of the frontals, the change being the loss of certain newly-formed associations or habits. Associations of long standing were reported to be exhibited as well after as before the removal of the frontals, and this fact may account for certain negative results obtained by other investigators. The loss of the associations was shown not to be due to the general shock effects of the operation as such, and it was shown that the associations were not lost after destruction of certain other portions of the cerebrum. The animals that had lost certain associations were able to "relearn" the associations, and a few experiments were reported in which animals lost the associations after a second operation on the frontal region. Many of the animals that were used showed signs of metabolism disorders, but this matter was not carefully investigated.

It was pointed out that not only the frontal regions but also the posterior association areas are probably concerned in the mental processes of man and animals, but less is known about the parieto-occipito-temporal association area than about the frontal. The suggestion is made that the frontal lobes are normally concerned with the production and retention of habits, and that the posterior association area may be likewise employed. The facts for the proof of the latter have not been sufficiently correlated, but as far as could be told at the time it appeared evident that the two areas are used for the formation of associations, the frontal area being concerned more with the motor part of the associational process, the posterior area with the sensory part. Until more data have been accumulated the differentiation in function between the anterior and posterior areas may be considered purely speculative, but it was hoped that some results in this line would be ready for publication within a year.

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[1] Read before University Medical Society, April 20, 1907.

Those specially interested were referred for a full account of the experiments to the monograph published by the reader. (On the Functions of the Cerebrum—The Frontal Lobes. Science Press, New York.)

SHEPHERD IVORY FRANZ, Ph.D.

IV. CASE OF PYONEPHROSIS WITH SPECIMEN.

Mrs. I., age 55, married and the mother of six children. About two months after the birth of her first child, which occurred in July, 1874, she had a severe attack of cramps in the left side of her abdomen, which lasted for four or five days. In a few days a large swelling was noticed in the left lumbar region. This began to subside in a few days but never went away entirely. The pain and cramps subsided synchronously with the subsidence of the swelling. These attacks of cramps and severe pain occurred with the swelling at intervals of from six months to two years up to the last attack, which occurred November 4, 1906. She was always confined to her bed from one to two weeks whenever these attacks came on, but they never seemed to interfere with her general health, as she was a very robust and otherwise healthy woman and gave birth to six perfectly healthy children, and had no especial trouble during any of her pregnancies.

I have been familiar with her case for the past ten years, and have seen her in about six of these attacks. Sometimes the muscle spasm and pain were so great that I had to use morphine to relieve her, but never more than twice or three times during any one attack, and then not more than a quarter of a grain was ever given at a dose. In many of her attacks she would relieve the pain with hot fomentations and rest in the bed without sending for a doctor. She had become so well trained as to what to do that she would at once go to bed and resort to this treatment with the result of being out in a few days.

On July 26, '06, she was taken again with great pain and cramps which did not yield to her treatment, so I was sent for. On examination I found a large hard mass extending from under the floating ribs down into the pelvis, and extending over the median line at least two dense adhesions around entire viscera; spleen much enlarged; culture from spleen; left lower lobe lung congested; bronchioles and alveolae filled with a muco-haemorrhagic material; pleura thickened and densely adherent; slight effusion.

Cultures: Bullion: Growth very slow and unsatisfactory; slightly cloudy and gives off odor.

Gelatin: Growth luxuriant; small bluish-white, rounded, elevated spots scattered diffusely over surface.

Milk: Coagulated.

Morphology: Non-motile organism occurring as small cocci usually in pairs, but a few chains were observed with and without capsule. The organism was recognized with difficulty until capsule was demonstrated by acetic acid and Gram's method.

Staining peculiarities: Stained with all the ordinary aniline dyes and shows capsule by acetic acid method.

Bacteriological conclusions: Incipient pneumonia with delayed resolution, followed by pneumococcic septicaemia and invasion of peritoneum.

GLENN I. JONES, M.D.

VI. AN ABDOMINAL WOUND WHICH OPENED UP ON THE ELEVENTH DAY.

Mrs. C. P., white, female, aged 39, widow. I was called to see her at her residence on February 2, 1907, when I secured this history: Excessive bloody flow from the uterus, which had been constant for the past two weeks. She was violently opposed to an examination and begged to be given a trial on some medicine before submitting to one. She was given fluid extract of ergot, gtts. xv, every three hours and told to inform me as to the result in forty-eight hours. At this time I was again called and found the flow was more excessive. The family history was negative, previous history, good. Menstruation began at fifteen and was normal, lasting from three to five days; she was married at twenty-two; she had one pregnancy and normal labor at twenty-four.

About two years ago it was noticed that the flow, while recurring regularly, was more profuse and lasted from five to seven days. She attributed this to worry over the death of her husband and business affairs. During the last three or four months has had more or less vaginal discharge, very offensive in character.

On January 22, flow began and has continued to this date, February 4. At this time she was much alarmed because of excessive flow and submitted willingly to an examination. The body of the uterus was found to be symmetrically enlarged and boggy, the cervix lacerated, indurated, and bleeding easily. There was a bloody discharge from the uterus.

Appendages appeared to be normal. Strongly suspecting carcinoma, I advised radical operation to be performed as soon as possible. To this the patient agreed. She entered George Washington University Hospital on February 7. At this time the blood examination showed four million four hundred and ten thousand reds, ten thousand six hundred and sixty leucocytes, 100 per cent hemoglobin. Examination of the urine showed it to be normal, except for the high specific gravity, 10.33, although the patient drank large quantities of water. On February 9, a combined vaginal and abdominal hysterectomy was performed. Clamps were left upon the uterine arteries and the vaginal vault, closed about them with catgut. Silk was used in the abdomen. The peritoneum and fascia were closed with continuous sutures of No. 2 catgut, and the skin with interrupted silkworm gut. Post-anaesthetic nausea was marked during the first thirty hours; clamps were removed on the third day and the patient established what appeared to be a good convalescence. On the eighth day the abdominal dressings were removed and the wound appeared to be in excellent condition, so the skin sutures were removed. All appeared to be going well until the eleventh day, when I was called in a great hurry to see her. I found to my great surprise that while using the bed pan the entire wound had opened up, the intestines being exposed and lying loose upon the abdomen. The house staff had bathed off and replaced the exposed bowel, and applied appropriate dressings. The patient was at once anaesthetized that the wound might be closed. Apparently there had been no union at all of the subcutaneous tissues, the omentum being adherent to the peritoneum, muscles and skin. It was found necessary to dissect out and ligate off quite a mass of omental tissue before the wound could be closed. The wound was closed with through-and-through mattress sutures of heavy silver wire. On the twenty-first day (the tenth day after re-closure) the patient developed phlebitis of the left limb, there being marked tenderness over the femoral vein but the pain most severe along the posterior tibial vein. On this day the abdominal sutures were removed but not until after phlebitis had appeared. Except for the phlebitis the patient made a good recovery and was discharged on the thirty-fifth day.

I have seen several cases where the abdominal wound had opened up some days after operation but never one which occurred so late as the eleventh day. It is my opinion that in this case the sutures of catgut in the peritoneum and fascia gave way at the time of the post-anaesthetic nausea and that the omentum at that time was forced up into the wound. That it had been there some days was shown by the adhesions.

The pathological report was made by Dr. D. W. Prentiss, who found the specimen to be non-malignant.

A. Barnes Hooe, M.D.

VII. METHOD OF LOCATING SURGEON'S WOUND UNDER PLASTER CASTS.

The application of a cast frequently covers a wound that the surgeon has made for the purpose of wiring, resection, or other operations upon bone. In order to insure a snug, strong cast the incision cannot be left exposed. So too, when the wound is to be dressed, the smallest window compatible with cleanliness will maintain the greatest rigidity. The size of the window bears an inverse ratio to the strength of the cast.

It has been my experience, actual and from observation, that a wound completely covered with plaster is difficult to locate with exactness, and the least amount of window cutting. Our landmarks are obscured in a hard white envelope, and the fenestra is made from memory. We not infrequently see casts so damaged from large, unnecessary windows, that the remaining isthmus is unable to withstand the strain, the plaster becomes pulverized along a line of greatest tension with only the crinolin left for support, allowing a free, hinge-like movement. In order to remove the minimum of plaster, it has been my practice in the last few months to employ large brass rug tacks, a head about ¼ inch in diameter, and steel point about ¾ inch, sterilized and placed at each end of the wound, upon the layer of gauze next to the skin. Gauze and cotton can be applied above this, the point easily penetrating. The cotton batting and plaster bandage are used in the ordinary way, care being taken that the tack pierces each layer as it covers it. When the cast is completed we have one steel point at each end of the wound, projecting from ⅛ inch to ½ inch, depending on the thickness of the dressing and cast. The points are afterward covered with corks or beeswax. Should the points project in such a region that the elevations would be objectionable, I would suggest that the tacks be previously heated over a gas flame to remove the temper and the points turned down with forceps after the cast has hardened; the tacks can be used repeatedly.

There are other ways of locating wounds under casts, but none, to my knowledge, that is so simple and exact, and that preserves the symmetry and beauty of a cast.

CHARLES S. WHITE, M.D.

VIII. CASE OF TYPHOID FEVER FOLLOWING EPIDEMIC INFLUENZA.

The following case is reported, not because of any peculiarity in the two diseases, but more because of the rarity of their sequence.

The history of the case is as follows:

Mrs. D. M. M., age 28, married, social condition good. Family history: Father died age 78, cause unobtainable, mother died at age of 57, with tuberculosis. Two brothers died with tuberculosis of lungs in early manhood. One sister died in early womanhood, with tuberculosis of lungs.

Previous history: Patient, while not robust, had never had a serious illness.

Present illness: Began suddenly January 1, 1907, with chilly sensations, headache, pains in the back and extremities, anorexia and a sense of fever. With the development of a slight cough the above symptoms had continued up until the morning of January 3, when I first saw the patient. A tentative diagnosis of influenza was confirmed by subsequent observation. The patient's condition gradually improved during the following ten days.

I was again summoned to see the patient on January 21, 1907. The subsequent cause of the condition showed a typical attack of enteric fever in every respect cardinal symptoms were all present. Epigastric pain, rose spots, coated tongue, fetid breath, enlarged liver, and spleen, widal reaction and leukopenia. The temperature curve as shown by morning and evening chart was characteristic. There was associated with the enteric infection an excessive catarrhal condition of the respiratory tract, the bronchitis being apical rather than basal, a condition that for some days considering the strong family history of tuberculosis, caused me no little uneasiness. There was, however, a perfect recovery.

EDGAR P. COPELAND, M.D.

IX. ANOMALIES OF THE ENCEPHALIC ARTERIES AMONG THE INSANE.

An important paper from the pen of Professor I. W. Blackburn on "Anomalies of the Encephalic Arteries Among the Insane" is to be found in a recent number of *The Journal of Comparative Neurology and Comparative Psychology*. In this article Doctor Blackburn has described all the anomalous conditions of the arteries of the Circle of Willis in a series of two hundred and twenty consecutive autopsies, of which number only sixty-five showed no anomaly. Each of the main arteries are considered separately and statistics are given of the frequency of anomalous conditions in it. Three cases are reported at length, forty are given briefly, and there are illustrations of nineteen of the most striking abnormal arrangements of the arteries. Although primarily anatomical in scope the article contains much material that the physiologist, the neurologist and the surgeon should keep in mind. It is hoped that Doctor Blackburn will amplify in another article his general remarks on the mechanics of the cerebral circulation, and that he will also publish in an appropriate journal a correlation of the anomalous arterial conditions with the pathological changes in the cerebrum and cerebellum.

X. KING'S MANUAL OF OBSTETRICS.

The recent, the tenth, edition of Dr. A. F. A. King's Manual of Obstetrics has been received with as many expressions of approval as were the earlier editions. Some of the errors of the previous edition have been corrected and some of the older methods omitted. The chapters on fecundation and nutrition of the embryo have been largelv rewritten and there have been extensive changes in the chapters on pelvic deformities, cutting operations on the mother, mutilating operations on the child, placenta previa, and puerperal septicema. Many new cuts and three colored plates have added to the presentation of the subject. Of the book *The New York Medical Record* says: "It is characterized by accuracy, brevity and simplicity of statement. Many generations of students have found this book to be a most reliable guide and it can still be recommended as probably the best small book on the subject." *The Virginia Semi-Monthly* says: "It covers every essential, practical part of obstetrics. It would be difficult to suggest any eliminations in the text." The reviewer in *The American Journal of Medical Sciences* writes: "It is a pleasure to commend a work which in addition to the dignity and authority of age, exhibits also the freshness of rejuvenescence."

XI. NEW METHODS OF VERSION IN TRANSVERSE PRESENTATION.

As a science and as an art obstetrics is considered by most medical practitioners to be in a position similar to anatomy, that all of the important matters have been discovered, and that only the finer points need to be worked out in more detail. That careful observation and acuteness of reasoning in such a practice as obstetrics will be the means of discovering and applying new facts and of devising new methods is well shown by a recent paper by Dr. A. F. A. King, in which he describes a new method of delivery in cases of transverse presentation. The advantages of the new method are so obvious after one has read the article that it occasions surprise that it was not described or thought of years ago. For the proper appreciation of the matter the whole article should be read by all who have any obstetrical practice. The method was described before the recent meeting of the American Gynecological Society in Washington, was well received there and later a very complimentary editorial account appeared in the *New York Medical Journal*. The paper is entitled "New Methods of Version in Transverse Presentations," and is published in full in the August number of *Surgery, Gynecology and Obstetrics.* The article is illustrated by seven figures which not only greatly help in the understanding of the method but which prevent any misunderstanding.

XII. PRESENT DAY THEORY OF PULMONARY TUBERCULOSIS.

Dr. B. M. Randolph has an important resumé of the present day therapy of pulmonary tuberculosis that should have a wide circulation, (*New York Medical Journal,* September 1, 1906). In the article Dr. Randolph discusses the methods that are employed in these cases, and discusses at some length (1) rest, (2) pure air, (3) food, and (4) drugs. On the fourth topic it is stated that the only drugs which are to-day generally prescribed, because the patient has consumption, are cod-liver oil and creosote. The cod-liver oil should, however, be considered more as an easily digested food than as a drug. The creosote acts as a stimulant expectorant and at the same time it prevents dyspepsia, increases the appetite and in this way helps to keep up the general bodily health. It should be given in small doses, it is said, and not to the limit of tolerance on account of its deranging effect on the gastro-intestinal tract. The author summarizes his paper as follows: "Every method of treatment of pulmonary tuberculosis, which has stood the test, has for its prime object the improvement of nutrition. We cannot become narrow advocates of any one remedy system or method, but owe it to our patients to employ every available means that will lead to improved nutrition. We must take into consideration every circumstance connected with each individual patient, and modify our remedies, both in their selection and application, according to the needs of the patient." As a general summing up he says: "Treat the patient and the patient will take care of the disease."

XIII. OBSERVATIONS OF OPSONIC THERAPY IN WRIGHT'S CLINIC.

At the meeting of the George Washington Medical Society, November 16, 1907, Dr. John Benjamin Nichols gave an account of personal observations of opsonic therapy in the clinic of Sir Almroth E. Wright, at Saint Mary's Hospital, in London.

A year ago great interest was aroused in America by the addresses given by Dr. Wright on the opsonic theory and practice developed by him and his collaborators. This was followed last spring by a series of papers by American workers who for the most part had failed to obtain the results claimed by Wright and condemned and criticized his methods.

Under these circumstances, with enthusiastic claims on one side, and disparaging criticisms on the other, Dr. Nichols spent several weeks in the summer of 1907 in the clinic and laboratory of Dr. Wright, as well to observe the actual clinical results obtained by the ingenious originator of the method as to acquire the technique. The presentation of the observations thus made was the purpose of Dr. Nichols's report.

He gave an account of the materiel, the personnel, and the general methods and conduct of Dr. Wright's establishment. Large numbers of patients were observed under treatment, reporting ordinarily at the clinics every ten days. The particular forms of disease adopted to the treatment are chronic localized infections caused by any cultivable bacteria. The great majority of the patients were cases of localized tuberculosis, especially of the glands, joints, skin, and bladder. The remaining patients were those with infections of staphylococci (acne, furunculosis, carbuncle), colon bacilli (cystitis), steptococci, pneumococci, gonococci, nasal infection, etc. Many of the cases were of the most obstinate character, in which after all other therapeutic resources were exhausted in the skin, surgical, and other clinics of London the patients were sent as a last resort to Wright's service. Whatever results could be obtained in such desperate and refactory cases were all pure gain. While some cases did not show much effect from the inoculations, yet in many the treatment undoubtedly produced improvement and cure, and in some the results were really brilliant.

The principal controversy in this matter centers around the accuracy, the significance, the usefulness, and the feasibility of determinations of the opsonic index. As to accuracy, the workers in Wright's service seemed to be able to obtain consistent and agreeing results within a margin of variation small enough to be negligible. Some of the critics of Wright's methods exhibit an unfamiliarity with many of the minute details which are essential to reliability and accuracy; or are led astray in the effort to introduce innovations and "improvements" of the technique. As to the significance of the opsonic indices, the whole theory and practice of inoculation therapy as elaborated by Wright was based on these determinations. As to their usefulness, Wright, with all his clinical experience along this line, professes that he needs the information afforded by them as an aid in diagnosis and control of the treatment, and goes to much labor and expense to procure them. While in strictly chronic cases in which the inoculations do not have to be pushed, the course of the antibacteria activities can be largely "visualized," and the determination of the opsonic indexes as a control for every individual injection may perhaps be largely dispensed with or replaced by clinical observation, yet for certain diagnostic purposes, and as a guide to inoculation in acute septic cases, reliance on opsonic estimations will be necessary.

As the result of his observations, Dr. Nichols believed that the conclusion was justified that in the class of cases to which it is adapted, chronic localized infections due to the tubercle bacillus, staphylococcus, streptococcus, pneumococcus, gonococcus, colon bacillus, micrococcus catarrhalis, etc., and perhaps some acute septic conditions—controlled when necessary by opsonic determinations, the inoculation of stock or autogenous bacterial "vaccines" is a therapeutic agency of distinct efficiency and promise, either in association with other therapeutic measures or in cases after all other procedures have failed; and that it is a specific and curative method in cases in which there is no other specific or definite mode of treatment available aside from symptomatic or palliative measures.

XIV. ETIOLOGY AND CLASSIFICATION OF FUNCTIONAL HEART MURMURS.

P. E. McDonnold, M.D. (G.W.U. '98), Passed Assistant Surgeon U. S. Navy, contributes in the U. S. Naval Medical Bulletin, Vol. I, No. 3, an interesting article on the so-called functional or accidental heart murmurs with special reference to their etiology and classification. Dr. McDonnold states that his attention was first called to the great frequency of the so-called functional murmurs while serving on the medical examining board for the examination of candidates for entrance to the Naval Academy during which time about 350 young men ranging from 16 to 20 years came before the board for physical examination. These examinations were held immediately after the mental examinations had been passed and as a result the candidates appeared before the examining board in a state of more or less physical exhaustion. They had not only been spending long hours in study, with consequent loss of sleep, and possibly the overuse of tobacco, but had been attempting at the same time to bring themselves up to the required physical standard by athletic exercises of various sorts. The excitement attendant upon the examination acted as an additional factor in the production of such a large number of functional heart murmurs that the members of the examining board came finally to expect a murmur rather than the contrary in every candidate who presented himself. The greater portion of these murmurs were systolic, with maximum intensity in the pulmonary area, but a number had their maximum intensity in the mitral or aortic areas, and they were accompanied at times by physical signs which made their differentiation from organic murmurs exceedingly difficult. This experience interested Dr. McDonnold in the significance of such murmurs, and in his paper he summarizes the important literature on the subject with special reference to the frequency of heart murmurs and the causes to which they may be attributed.

Among the causes which have been suggested as being productive of functional murmurs, at times, are the following: Pressure on the pulmonary artery by the heart during systole, squeezing it against the chest wall as a result of the retraction of the lung from the base of the heart (Quincke); spasm of the columnae carneae, preventing perfect closure of the valves (Upshur); disproportion between the size of the ventricular cavities and the length of the chordae tendineae and musculi papillaries (Bristowe); a lateral displacement of the origin of the musculi papillares on account of dilatation of the heart (ibid.); imperfect closure of the valves from rapid heart action or a disturbance of the pneumogastric nerve from gastric disorders (Conkling); a dilatation of the alveoli of the lungs from frequently holding the breath, as in heavy lifting or hard labor, accompanied by a temporary stagnation of the blood and its sudden release—this becoming a habit and inducing chronic changes (ibid.); a friction between the pericardium and the chest wall caused by a wrinkling of the former or by the "white patch" on the wall of the right ventricle (ibid.); pleuropericardial friction (Syers); pericardial and phrenic friction when the stomach is distended with gas (Root and others); palpitation of the heart from nervous causes (Allbutt); sonorous vibrations transmitted to the stethoscope by a peculiar ventricular shock at times, and, on other occasions, vibrations of the conus arteriosus of the right ventricle (Drummond). Finally, Davidson would explain all murmurs by vibrations set up in the valves of the heart by impact of the blood stream at an oblique angle.

Dr. McDonnold thus concludes his study: "We have seen that while these murmurs are functional in the sense of their not being due to organic valvular disease, a certain number of them are dependent for their production upon disease or debility of a more or less temporary character of either heart muscle, the tissues in immediate proximity to the heart, of the body elesewhere. It has been shown that a purely functional murmur, however, may occur at any point over the praecordia during comparative health, and that unless there are signs of cardiac enlargement, venous engorgement, or systematic disease coexistent with a murmur it cannot be taken as indicative of either organic heart disease or of serious ill health. The presence of a murmur therefore should merely put us on our guard as examiners and cause us to look for other signs which alone will determine the true significance of the sound."

W. F. R. PHILLIPS, M.D.

BIBLIOGRAPHICAL RECORD.

DECEMBER 1, 1906, TO DECEMBER 1, 1907.

This Bibliographical Record is the third annual Supplement to the University Bibliography, containing titles of books, monographs, papers, etc., published by members of the Faculty and Doctors of Philosophy, issued September 1, 1904. It embraces titles of publications by University instructors and graduates appearing during the past year, and complete lists of the publications of members of the Faculty whose names were not included in the Bibliography of 1904, or the 1905 or 1906 supplement. The abbreviations used are current in scientific publications.

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VANCE, WILLIAM R., Ph.D., LL.B., Professor of Law (1903-), and Dean of the Department of Law (1905-).

Legal education in the South. G.W.U. Bull., VI, No. 3, 18-27; Oct., 1907.

VEITCH, F. P., M.S. (G.W.U., 1898-).

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Assistant Editor of "Chemical Abstracts," in charge of abstract work on soils and fertilizers.

WHITE, WM. A., M.D., Professor of Mental Diseases (1903-).

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WILEY, HARVEY WASHINGTON, Ph.D., Professor of Agricultural Chemistry (1893-).

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WILLIS, H. PARKER, Ph.D., Professor of Finance (1905-).

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WILLOUGHBY, W. W., Ph.D., Professor of Political Science (1907-).

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The Nature of the State. The Macmillan Co., 1896.

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The Political Theories of the Ancient World. Longmans, Green & Co., 1903.

The American Constitutional System. The Century Co., 1904.

Also numerous contributions to current periodicals.

UNIVERSITY APPOINTMENTS.

DEPARTMENT OF ARTS AND SCIENCES.

FACULTY OF GRADUATE STUDIES.

Assistant Professor of Physics: **PERLEY G. NUTTING, PH.D.**

A.B., Stanford University, 1897; M.S., University of California, 1899; Whiting Fellow at University of Göttingen, 1901-1902; President White Fellow, Cornell University, 1902-1903; Ph.D., *ibid.*, 1903; Assistant in Physics, Stanford University, 1897-1898; Assistant in Physics, University of California, 1898-1901; Assistant Physicist, U. S. Bureau of Standards, since 1903; Member American Physical Society, Philosophical Society of Washington, American Association for the Advancement of Science.

COLUMBIAN COLLEGE.

Professor of Zoology for 1907-'08: **C. DWIGHT MARSH, PH.D.**[*]

A.B., Amherst College, 1877, A.M., *ibid.*, 1880; Ph.D., University of Chicago, 1904; Professor of Chemistry and Biology Ripon College, 1883-1889; Dean of Faculty, *ibid.*, 1900-1903; Acting President, *ibid.*, 1900-1901; Professor of Biology, Earlham College, 1904-1905; Expert in Poisonous Plant Investigations, Bureau of Plant Industry since 1905; President of Wisconsin Academy of Sciences, Arts and Letters, 1896-1899; Member of Board of Commissioners Wisconsin Geological and Natural History Survey, and Secretary of Board, 1897-1899; Biologist, *ibid.*, 1899-1904; Fellow American Association for the Advancement of Science, Member American Society of Naturalists, American Society of Zoologists, Botanists of the Central States, etc.

DEPARTMENT OF MEDICINE.

Professor of Bacteriology and Pathology: **JOSEPH J. KINYOUN, M.D., PH.D.**

M.D., Bellevue Hospital Medical College, 1882; Ph.D., Georgetown University, 1894; Studied, University of Berlin, 1890-1891, Institute Pasteur, Paris, 1891 and 1894; Director Hygienic Laboratory, U. S. Marine Hospital Service, 1889-1899; Professor of Bacteriology and Pathology, Georgetown University, 1890-1899; Special Lecturer on Immunity Serum Therapy and Protective Inoculations, 1903-1907; Member American Medical Association, Association of American Physicians, Association of Bacteriologists and Pathologists; Society of American Bacteriologists, The College of Physicians of Philadelphia, the Pathological Society of Philadelphia, American Public Health Association, the American Association for the Advancement of Science.

Assistant Professor of Pediatrics: **J. FREMONT SMITH, M.D.**

A.B., Dartmouth College, 1880; M.D., University of Pennsylvania, 1883; Member New York Academy of Medicine, American Climatological Association, American Medical Association, American Association for Study and Prevention of Tuberculosis, Medical Society of the District of Columbia.

Assistant Professor of Surgery: **WILLIAM FRANCIS MATTINGLY SOWERS, M.D.**

A.B., Princeton University, 1896; M.D., Johns Hopkins University, 1900; Resident House Officer, Asst. Resident, Resident Surgeon, Assistant and Instructor, *ibid.*, 1900-1907.

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[*] In place of Professor Paul Bartsch who is on leave of absence.

DEPARTMENT OF LAW.

Instructor in International Law: ELLERY C. STOWELL, A.B., LL.B.

A.B., Harvard, 1898; Studied, University of Berlin, 1903-1904; Graduated École libre des Sciences politiques (Section diplomatique), and licencié en droit, University of Paris, 1906; Secretary for the Delegation of Panama at the Hague Conference, 1907.

UNIVERSITY MISCELLANEA.

Dean Howard L. Hodgkins, of the Department of Engineering, attended the meetings of the American Association for the Advancement of Science, held in Chicago, December 30 to January 4.

Professor Mitchell Carroll attended the meetings of the American Philological Association and the Archaeological Institute of America, held at the University of Chicago, December 28-31. He has been granted a leave of absence by the University for the first ten days of January, that he may visit Denver and other cities in the interests of the Archaeological Institute of America.

Professor James Brown Scott, of the Department of Law, was tendered a dinner at the New Willard Hotel, Saturday evening, December 21, in recognition of his distinguished services as Technical Delegate of the United States to The Hague Conference. About 100 were present. Hon. H. B. F. Macfarland acted as toastmaster. Speeches were made by Ambassador Bryce, Hon. John W. Foster, President Needham, Professor Scott, and others.

Professor C. W. A. Veditz, during the Christmas holidays attended the meetings of the American Sociological Society, of which he is Secretary, at Madison, Wisconsin, and of the American Economic Association. Dr. Veditz has been made editor-in-chief of the quarterly periodical issued by the latter.

During the approaching summer, Dr. C. W. A. Veditz will be a member of the Summer School faculty at the University of Michigan. He will offer courses in theoretical and practical sociology and an advanced course in "Suicide."

Rev. Benjamin Alfred Dumm, Ph.D. (G.W.U., 1900), Pastor of the First Church, Stoneham, Mass., has recently conducted a series of conferences on "The Social Problem," under the auspices of the Woburn Association of Massachusetts.

We are in receipt of a paper read at a meeting of the American Brewing Institute, held at The Chemists' Club, New York City, entitled, "Improving the Quality of Domestic Hops," by W. W. Stockberger, Ph.D. (G.W.U., 1907).

Dr. H. L. McBain, Instructor in Political Science, will deliver a lecture at Richmond College early in January, on "The Teaching of Political Science in the South."

The Maryland Agricultural Experiment Station has published the thesis of Martin N. Straughn, Ph.D., 1906, as Bulletin 20, under the title "Sweet Corn Investigations."

We are in receipt of a copy of the "Report of the Board of Education of Summit, New Jersey," for the year ending June 30, 1907, by Louise Connolly (B.S., 1893, M.S., 1895, G.W.U.), Supervising Principal of the public schools of that city.

The Bureau of Standards of the Department of Commerce and Labor, has published as Reprint No. 64, the thesis submitted by Frederick W. Grover for the degree of Ph.D., June, 1907, entitled, "Simultaneous Measurements of the Capacity and Power Factor of Condensers."

Dr. Perley G. Nutting, of the Bureau of Standards, has been appointed Assistant Professor of Physics under the Faculty of Graduate Studies. His academic record appears elsewhere in this Bulletin. Since 1903, he has been Assistant Physicist at the Bureau of Standards, and is considered an authority on optics and spectroscopy. Dr. Nutting will conduct both theoretical and experimental work on spectroscopy.

The Classical Club will hold its eighth anniversary exercises on Saturday evening, January 4, 1908, in University Hall. Professor David G. Hogarth, Director of the Cretan Exploration Fund, and for sometime Director of the British School at Athens, will give an illustrated lecture on "The Aegean and Crete."

Arrangements have been made by the University Debating Council for three intercollegiate debates. There is to be a return debate with the University of North Carolina, which met defeat here last year at the hands of the local university. The men who will represent the latter are J. M. Berry and E. G. Schreiber. The debate will take place at Chapel Hill, N. C., late in March.

The other debates are to be with the University of Pennsylvania and the West Virginia University, both probably in this city, one in April and one in May. It is understood that in addition to the debates with Pennsylvania, North Carolina and West Virginia, endeavors have been made to meet Virginia and Georgetown.

An article on the "George Washington University College of Engineering" appeared in the *Electrical World* of November 30, 1907. It describes particularly the laboratory facilities that have been added this fall, and calls attention to the efficiency of the teaching staff and the record made by its students.

Mr. Arthur P. Davis, Chief Engineer of the United States Reclamation Service and a graduate in civil engineering of the George Washington University, was elected President of the Washington Society of Engineers at the annual meeting on December 17. Professor Philander Betts, of the faculty of the College of Engineering was elected to the Board of Directors of the Society. This Society was organized in 1905, and has more than 300 members. The first president was Admiral C. W. Rae, Chief Engineer United States Navy and a trustee of the Washington College of Engineering. The second president, who has just retired from office, was Mr. F. H. Newell, Director of the United States Reclamation Service and also a trustee of the Washington College of Engineering.

George E. Myers, Ph.D., Lecturer on the History of Education, attended the meeting of the Association of Colleges and Preparatory Schools of the middle states and Maryland, held in New York during the Thanksgiving recess, and read a paper upon "Influence of Present Methods of Graduate Instruction Upon Teaching in Secondary Schools." Dr. Myers also addressed the meeting of the Federal Schoolmen's Club, of Washington, on December 8, upon the subject of "Certification *vs.* Examination for College Entrance." His remarks were followed by an unusually interesting discussion.

About January first there will be issued a text book of psychiatry by Dr. W. A. White, Professor of Mental Diseases and Superintendent of the Government Hospital for the Insane. The book is intended for the use of students in connection with the course of lectures and demonstrations that are given by Dr. White during the second semester. The announcement and table of contents indicate that the classification of mental diseases is somewhat similar to that of Kraepelin, and that more attention than is usual in such works is to be devoted to the practical examination of the insane.

The Division of Education has established a department library, which promises to be of great service in connection with the educational courses. The library room is open throughout the day, and is conducted as a seminary reference library, although the privilege of drawing books for over night is extended to members of the educational classes. The history of education, general educational theory, the theory and practice of secondary and elementary education, methods of teaching special subjects, general and comparative psychology and child study, are all well represented. The reports of the Commissioner of Education, proceedings of the National Educational Association, and the current educational and psychological journals are also represented.

Dr. S. I. Franz, Professor of Physiology and Experimental Psychology, and Psychologist in the Government Hospital for the Insane, has been invited to deliver during the Christmas holidays two addresses at Toronto, and to demonstrate some methods of mental examination before physicians in the hospitals for the insane of the Province of Ontario, Canada. The topics of the addresses are "The Development and Needs of Modern Psychiatry" and "Problems and Recent Advances in the Study of Insanity."

Accounts of the main scientific and social proceedings of the recent International Congress of Physiology, at Heidelberg, and of Neurology, Psychiatry, Psychology, and Nursing of the Insane, at Amsterdam, have been written by Dr. Franz; a general account and comparison of the two congresses appears in *Science,* the important psychological papers are reported in the Journal of Philosophy, Psychology and Scientific Methods, and the neurological contributions of general interest are given in abstracts in *The Journal of Comparative Neurology and Comparative Psychology.*

Dr. William A. White, Professor of Mental Diseases, and Dr. Shepherd Ivory Franz, Professor of Physiology, attended the meetings of the First International Congress of Neurology, Psychiatry, Psychology, and the Nursing of the Insane, held in Amsterdam, September 2-7. Dr. Franz also attended the Seventh International Congress of Physiologists, in Heidelberg, August 12-16. Dr. White acted as representative for the United States at the Amsterdam Congress on a special board for the study of the etiology of insanity.

Several members of our Medical Faculty are participating in the preparations for the International Congress on Tuberculosis to be held in Washington, September 21 to October 12, 1908. Some of the most eminent of the foreign investigators in the fields of medical research and public hygiene have accepted the invitation of the committee of arrangements to take part in the series of lectures that will be delivered during the sessions of the Congress. Among those who have expressed their intention to attend the Congress are Dr. R. W. Philip, of Edinburgh, founder of the first tuberculosis dispensary; Dr. Theodore Williams, of London; Dr. Arthur Newsholme, health officer of Brighton, England, director of King Edward's Sanitarium; Dr. C. H. Spronck, of Utrecht, Holland; Dr. Karl Turban, of Davos-Platz, Switzerland, the originator of the scheme generally followed at present for the classification of tuberculosis; Dr. Gotthold Pannwitz, of Berlin, secretary general of the International Conference on Tuberculosis; Dr. Emil von Behring, of Marburg, the originator of the diphtheria antitoxin; Dr. A. Calmette, director of the Pasteur Institute at Lille, France; Dr. Maurice Letulle, of Paris, secretary general of the last International Congress of Tuberculosis, and Dr. S. Kitasato, of Tokio, Japan, director of the Imperial Institute for the Research of Infectious Diseases.

The Congress will be divided into seven sections—pathology and bacteriology, over which Dr. William H. Welch, of the Johns Hopkins, will preside; clinical study of tuberculosis, presided over by Dr. Vincent Y. Bowditch, of Boston; surgery and orthopedics, Dr. Charles H. Mayo, of Rochester, Minn., president; tuberculosis in children, under the presidency of Dr. Abraham Jacobi, of New York City; hygenic, social, industrial and economic aspects of tuberculosis, Mr. Edward T. Devine, of New York City, president; state and municipal control of tuberculosis, under the presidency of Surgeon General Walter Wyman, of the United States Public Health and Marine Hospital Service, and tuberculosis in animals and its relation to man, Dr. Leonard Pearson, of Philadelphia, president.

The George Washington University Medical Society which was organized in 1905 is steadily growing in interest and effectiveness, and has entered upon its third year with an enlarged membership. It holds regular monthly meetings for the reading and discussion of papers and informal smokers follow the regular exercises.

The following is a list of papers read since October, 1906 up to the close of the year 1907:

1906
Oct. 20. Tetanus. By Dr. H. S. Medford.
Nov. 17. Cholelithiasis. By Dr. E. C. Prentiss.
Dec. 15. Acute Glandular Fever. By Dr. Glenn I. Jones.

1907	
Jan. 19.	(1) Biographical Sketch of Dr. Jesse Ewell, the first graduate of the Medical School. By Dr. Jesse Ewell, his grandson. (2) Ten Years' Experience as an American Surgeon in China. By Dr. W. H. Dodson.
Feb. 16.	Tic Douloureux and Its Treatment by Deep Injections of Alcohol. By. Dr. Wm. H. Syme.
Mar. 23.	The Routine Use of the X-ray in Fractures, with Stereopticon slides. By Dr. Chas. S. White and Dr. Thomas A. Groover.
Apr. 20.	(1) Sterility in the Male and Its Operative Treatment. By Dr. Francis R. Hagner. (2) Functions of the Cerebral Frontal Lobes. By Dr. Shepherd I. Franz.
May 18.	Second Annual Meeting and Smoker, with Address by the President, Dr. J. W. Chappell.
Oct. 19.	(1) The history of the Medical School. By Dr. A. F. A. King. (2) Observations on a Newly Reported Method of artificial Respiration. By Dr. Shepherd I. Franz. (This is the first time this method has been demonstrated before a medical society in this country.)
Nov. 16.	Observations of Opsonic Therapy in Wright's Clinic. By Dr. J. B. Nichols.
Dec. 21.	Manic Depressive Insanity. By Dr. Wm. A. White.

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